

SEP 17 1923

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

Vol. XLIX
Number 11

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, SEPTEMBER 13, 1923

Thirty-five cents a copy
Three dollars a year

The *prevailing* Steel Wheels

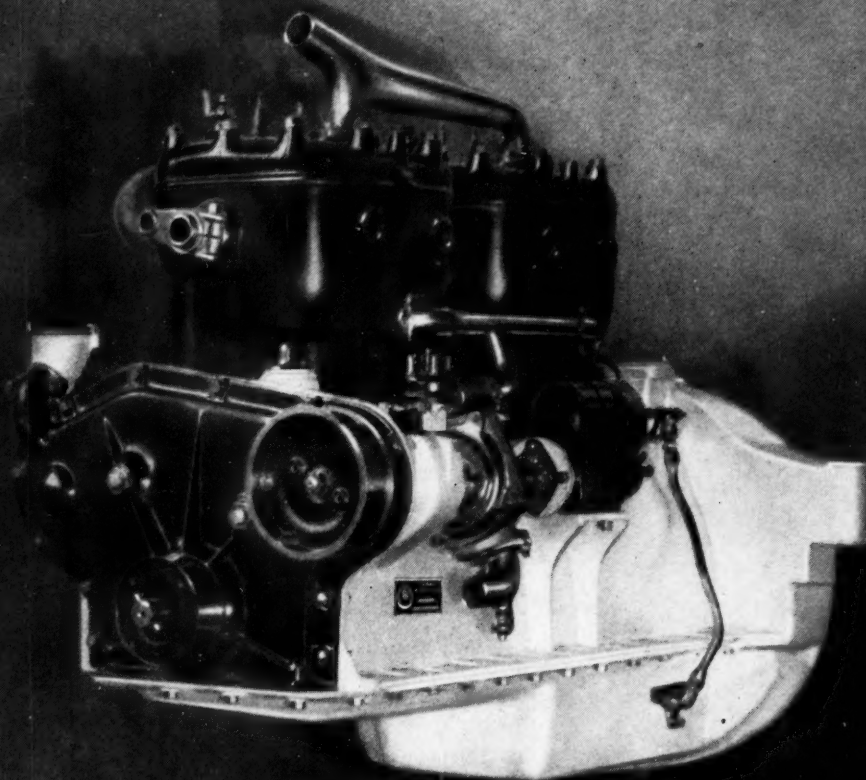


Tuarc • Disteel • Forsyth

MOTOR WHEEL CORPORATION



LANSING, MICHIGAN



*The New Series, Model B5—
a truck motor. Just one
of the many Continentals
built to fill every truck
requirement.*

TWENTY-TWO years devoted by the largest organization of motor specialists in the world to the building of motors have placed the Red Seal Continental Motor above comparison and beyond competition. The established mark of this motor specialization is and always will be—the Continental Red Seal.

Built by the largest motor Specialists in the world

CONTINENTAL MOTORS CORPORATION

Detroit and Muskegon, Michigan



AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLIX

NEW YORK—THURSDAY, SEPTEMBER 13, 1923

No. 11

Its Position Strong, Industry Can Proceed Confidently

How long present sales volume will continue is chief question. Purchasing power of country so high it can keep on buying at present rate indefinitely if inclined. Policy of caution wise, however. Plans for 1924 expansion seem somewhat premature.

By James Dalton

EVEN veterans of the industry, who have become hardened to all kinds of surprising developments, frankly express amazement at the unprecedented demand for automobiles in what usually is considered a slack season.

Production in the mid-summer month of August of 348,000 motor vehicles, only 45,000 under the peak month for all time, again gives the lie to the theory of an inevitable seasonal summer slump. July was 66,000 under the record, but more than half this loss was due to the fact that several of the larger companies were preparing to go into production on new models. They had not regained their full manufacturing stride in August, although a considerable gain was recorded.

This is another proof, if further evidence is needed, that trade practices are chiefly responsible, when general business is good, for whatever falling off there may be in the vacation months.

The first eight months of 1923 have been written into history and the industry is chiefly concerned about what the next four will bring. It is only a little less concerned about what to expect after the turn of the year.

If European conditions could be disregarded entirely it would be reasonably safe to predict that business will be good, not only for the next quarter but for the next four quarters. Unhappily, however,

we cannot count ourselves entirely independent of the rest of the world.

Premier Mussolini, the pristine Socialist who used "strong arm" methods to make himself dictator of Italy, seems determined to embroil the Balkans in battle. When the Balkans boil, the rest of Europe sizzles, and the entire Continent is a powder magazine. Mussolini has a match in his hand and he may drop it into a keg which will blow all Europe into kingdom come.

Mussolini Gestures Dangerous

NOTHING is to be gained by trying to minimize the seriousness of the European situation. The "diplomats" and politicians have jockeyed about until almost anything is likely to happen. England is sitting on the lid, but she has exceedingly grave problems of her own, one of the chief of which is unemployment. If war comes on a large scale, this country cannot proceed placidly on its way as though nothing were happening.

The chief immediate danger in the situation rests, however, in the antics of Mussolini. If some way can be found to spank him and make him quit practicing the "dramatic gestures" to which he has become addicted, serious trouble may be warded off for some time.

Notwithstanding the maneuvers of the apparently bloodthirsty "statesmen" on the Continent, all the

countries which suffered most severely from the great war have made important economic progress in the past year. Present conditions already have been discounted in this country, and unless there are new and tragic developments the chief effect of the European unrest will be a certain feeling of hesitancy on the part of American industry. The same is true in the rest of the world, which has regained much of its pre-war prosperity, although it is dependent in greater measure than the United States upon the course of events on the Continent.

General Business Is Good

THERE are few clouds on the domestic business horizon and none of them is black. General business is good and has been good all summer, although there seems a strange reluctance to admit it. A good many people seem to have been lying awake nights trying to think up arguments which would prove that there had been a heavy shrinkage in the volume of trade.

The unprecedented freight car loadings, week in and week out, especially of merchandise and miscellaneous freight, have demonstrated the fallacy of this contention. If corroborative evidence were required, plenty of it could be found without difficulty, but none is needed.

Volume of motor vehicle sales obviously depends in large measure upon the purchasing power of the public. When labor is fully employed at high wages, as it is now and has been for many months, no fear need be felt about the ability of Americans to buy what they want.

Until there is a shrinkage in purchasing power, resulting from a curtailment of industrial activity generally, with a large number of workers unemployed, the automotive industry need not be disturbed about the ability of this country to absorb large numbers of automobiles if it is so inclined. There is nothing whatever to indicate that there will be any material slackening in the speed of industry for the rest of this year, assuming that there are no disastrous foreign developments.

This contention is borne out by a survey of the fundamental trends which influence business and industry:

COMMODITY PRICES—The downward revision which began in the early spring has been checked and the prices of raw materials are strengthening. There will be no runaway markets, however, and the general long swing trend of the market will be downward.

PRODUCTION—Following "seasonal" declines in several lines during the summer, productive activity has begun to increase. Generally speaking, summer output was larger than usual.

LABOR—Demand for labor is increasing. Wages are stable and promise to remain at current levels, at least for the rest of this year. With the settlement of difficulties in the anthracite coal fields, no large strikes are in progress.

TRANSPORTATION—Although car loadings have been unprecedentedly heavy, the net surplus of cars is large and the carriers already have stocks of cars ready for the movement of grain. The railroads are showing greater efficiency than ever before and there are no indications of serious congestion this fall.

AGRICULTURE—Conditions are exceedingly "spotty." Outlook in the wheat areas is not favorable, but the cotton belt will offer better opportunities than in a long time. Speaking generally, the purchasing power of the farmer probably will be larger than it was a year ago.

DOMESTIC TRADE—Retail stocks are low. Sentiment among retailers is optimistic and the volume of

orders being received by wholesalers and manufacturers is increasingly large.

FOREIGN TRADE—Exports, especially of motor vehicles, are increasing and the trade balance is again favorable to the United States.

MONEY AND BANKING—Interest rates are firm and promise to remain so, possibly with a slight upward tendency. Reserve bank statements indicate a general strengthening, with a sharp reduction in discounted bills and further gains in gold stocks. Savings deposits are steadily increasing.

All of which doesn't mean that there's going to be a "boom" in the generally accepted meaning of the term. We have had no "boom," however, and want none, for such a period brings speculation, over-extension, reckless buying and runaway markets. We were headed toward one early in the year, but fortunately the brakes were applied in time. In consequence of this caution commodity prices dropped rather sharply and there was a slowing up in certain lines, but it was not serious enough to cause general distress.

The number of workers unemployed is a never failing barometer of industrial activity and there have been mighty few people out of work in this country in the last year. There always have been and always will be a certain number not employed, because they are conscientious objectors when it comes to work. Skilled workers in practically every line have been fully employed all summer, and the same is true of common labor. Complaints come from many quarters of a shortage of help.

Only in the textile mills of New England, and to a lesser degree in those of the South, have operations been slow for the last three months. That has been due largely to violent fluctuations in the prices of raw materials and reluctance of buyers to place orders in the face of such uncertainty. The price question has had more to do than anything else with whatever slackening there has been in most other lines.

Plentiful Supply of Money

THE high cost of materials, scarcity of labor and high wages caused postponement of many large new building projects, but enough already were under way to result in an unprecedented volume of operations for the year, and conditions in the trade have improved to such a degree that 1924 promises to be another big year. There still is a large shortage of all kinds of buildings, particularly dwellings, and rents in the larger cities are rising again.

One point to which not enough attention has been given is that so long as there is a plentiful supply of money a reasonable degree of prosperity is assured. That has been the unfailing history of the United States and there is no reason to assume that it will not continue to be. Interest rates are relatively low and there is an enormous reserve of cash available for legitimate business. No sound enterprise need suffer from lack of credit. Buttressed by the Federal Reserve system and a fabulous reservoir of gold, only a wild orgy of inflation could result in serious financial strain.

While it is easy to determine from a survey of the general situation that conditions are thoroughly sound and that there is no occasion to fear serious reverses as long as the lid stays on in Europe, it is much more difficult to forecast confidently what will happen in the automotive field in the next few months.

If it can be assumed that buying will continue in large volume so long as the purchasing power of the

country is as high at it has been for the past year, then sales will continue to be good for the rest of this year and probably next year. Proceeding on this theory, and it seems a perfectly logical one to accept, there is no reason to look for a slump.

It has seemed each month for the last twelve that there must soon be a flattening out in the enormous demand for motor vehicles of all kinds, but, happily for the industry, there has been little variation in the volume of orders. Low, middle and high priced cars have been going as fast as they could be turned out.

As AUTOMOTIVE INDUSTRIES pointed out in its issue of Aug. 30, motor vehicle sales next year will not, under any unfavorable circumstances short of a panic, fall below a 2,000,000 minimum. How much higher than that they will go depends entirely upon various factors. The longing for automobiles which had been repressed for some time was released early last year and the industry has been feeding it ever since. No means are at hand for estimating how much of that demand has been satisfied, how much of it has come from replacements, or how much from first buyers.

Production Predictions

ON the surface it does not seem possible that the American people can continue indefinitely to absorb automobiles at the present rate, but neither did it seem possible at the beginning of the year that 1923 sales could approximate 4,000,000.

One man's guess is about as good as another's, and any estimate of sales for next year, beyond the minimum of at least 2,000,000, is purely guesswork. And basing business plans on guesses is precarious. True it is that the outlook is exceedingly bright, but it will be hazardous to proceed on the assumption that next year will be as good as this just because there is no tangible reason for expecting it not to be.

The automotive industry has steered a pretty straight course since 1920. If it has erred at all it has been on the side of caution in making commitments to meet the requirements for the business which it was certain of getting, but it cannot be criticised for having "played safe." Never before in its history has it been in as strong position as it is today. Its profits have been large, it has acquired substantial reserves in spite of the heavy losses suffered in the period of depression, plant expansion has not been general, and inventories are comparatively small and well balanced. So far as any one knows definitely there has been no general stocking of cars, although open models dragged somewhat early in the year. Dealers are behind in orders for closed cars, and they probably can find a ready market for as many as can be made the rest of this year.

New Models Arouse Interest

EXTRAORDINARY interest has been aroused by the 1924 models which have been coming out for the past six weeks, and more of which are in prospect. Mechanical improvements and refinements have been unusually numerous and important. They undoubtedly have stimulated sales, and if the public stamps with approval certain changes which have been made there may be a rush of owners of perfectly serviceable cars of earlier make to get those which embody the latest ideas. If such is the case the replacement market next year may be above normal.

Another highly favorable factor is to be found in the price reductions which have been made by various companies and which promise to be more or less general.

None of them has been large, but they have served to impress upon the public the fact that automobile makers are perfectly willing to pass on to the buyers of their products any savings which may be effected.

Good business always warrants price revisions downward so long as they do not involve an unwarranted sacrifice of profits. Every cut brings new prospects into the market. Such changes as have been made recently strengthen rather than demoralize the market. The public knows it is getting greater automobile values than it ever did before, and this not only has increased demand but has created confidence, something which was sadly needed. The attitude of bankers, for example, is more favorable than it ever was before.

Here and there will be heard the comment that automobile makers always lower their lists when sales slump, but on this occasion, at least, business had not fallen off enough to make reductions necessary. The fact remains, however, that competing manufacturers are preparing for a sharper business battle. This is reflected not only in price revisions, but in the numerous improvements in new models. The dealer also has been considered and every effort has been made to provide selling arguments which will have weight in the universal effort to strengthen the retail organization in the field. Competition promises to be particularly sharp among producers of low-priced six-cylinder models.

Some Elements of Uncertainty

CONSIDERING all the circumstances it is perfectly justifiable to expect a large business for the next twelve months, and it may be reasonable to expect a sales volume equal to that of the first eight months of 1923. But there is every evidence that most of the large producers are planning upon a still greater output in 1924. If they are, we believe they are inviting trouble, even though they may have supreme confidence in their products and in their ability to take business away from their competitors. Percentages of total sales made by the leaders in each price class are not likely to show radical changes and there seems little substantial basis for a belief that the total market will be larger in 1924 than in 1923, if as large.

There are too many elements of uncertainty to justify serene preparations for maximum possible production for an indefinite period. Present sales volume, like the brook, may go on forever, but then again it may not. It costs less, in the long run, to speed up than it does to slow down. It will be foolish not to take advantage of ups and downs in the materials markets to cover the minimum requirements which each factory can figure out for itself, but beyond that each step should be measured carefully.

The industry has had an enormously profitable year while following a policy of caution and it will be the part of wisdom to continue that policy.

Export markets should not be overlooked. They are becoming increasingly important and will continue to do so unless there is some serious political upheaval.

So far as economic conditions go, therefore, the United States has little to fear except as the result of a convulsion of Europe. Barring entirely unforeseen complications, general business will be good for a considerable time to come. The volume of motor vehicle sales will be large, but there are enough factors of uncertainty involved to make unwise the assumption that demand will continue indefinitely to be as heavy as it has been thus far this year.

New Principle of Balancing 8-Cylinder V-Engine Feature of 1924 Cadillac

Crankshaft has four crank throws in two planes at right angles to each other. Designed to permit reciprocating inertia forces to cancel out. Four-wheel brakes are standard equipment. Body models have been changed materially. Transmission is improved.

By J. Edward Schipper

INTRODUCING an entirely new principle in eight-cylinder, V-engine balance and incorporating a four-wheel braking system, the new Cadillac type V-63 has been put on the market to supersede the 61. With the exception of the new engine and brakes the chassis remains practically unchanged. The exterior appearance of line has been materially affected, however, by a complete new series of bodies, eleven in number. All prices will be slightly increased.

The new bodies provide more leg, side and head room, but because of the higher radiator, longer hood and better blending of the lines the cars are actually lower and longer in appearance, although the 132-in. wheelbase remains unchanged. The appearance is further improved by a new nickel and Bakelite radiator cap and a new design of head and side lamps. The head lamps are more nearly cylindrical in shape and the side lamps are bullet type. The fenders on the new model are more deeply crowned and made from heavier steel, and the edging continues into the black enamel edge of the running board to give the fenders the appearance of running the full length of the car.

With the exception of the cylinder dimensions ($3\frac{1}{8}$ by $5\frac{1}{8}$ in.) practically every important dimension of the engine has been altered. Following previous practice, the cylinders are cast in blocks of four placed at an angle of 90 deg. to each other, with the cylinders directly opposite. The changes in the engine result largely from the new crankshaft which differs from the preceding type in respect to arrangement of the crank throws and in that it is provided with compensators or counterweights. The new crankshaft has four crank throws in two planes at right angles to each other, instead of having all four in one plane.

The rearrangement of the crankshaft throws, combined with the counterweights, has resulted, according to the Cadillac engineers, in putting the engine in inherent balance. According to accepted theory, the 90 deg. V engine with cranks all in one plane, is subject to

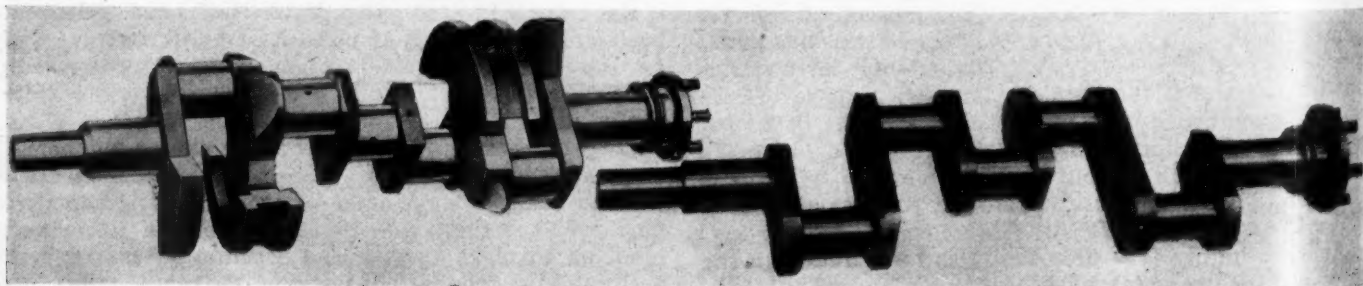
cross vibration. It is claimed that the new crankshaft eliminates unbalanced forces and that this is proven both by mathematical analysis and by driving experience.

The firing interval is not changed by the rearrangement of the crank throws, although the firing order has been altered. The power impulses occur 90 deg. apart, the same as in previous Cadillacs. The firing order, however, is entirely different, as will be explained.

The new crankshaft has been designed to permit the reciprocating inertia forces in the two blocks of four, which are responsible for the cross vibrations, to completely cancel out. A graphical demonstration of this fact is given in the supplement at the end of this description. By placing the crank throws in two planes at right angles to each other, the inertia forces are divided into pairs of forces which are equal and opposite, although not in the same plane. The effect of these forces is then neutralized by the compensators. The weights of the compensators and the angles at which they are placed are so calculated that the centrifugal effect is designed to cause the whole assembly, including crankshaft, connecting rods and pistons, to operate in dynamic balance.

Crankshaft Bearing Stresses Lighter

The crankshaft is supported on three main bearings as formerly. The bearing stresses on the new model, however, are lighter, not only because of the reduced vibration, but also because the crankshaft on the new model is $2\frac{3}{8}$ in. in diameter whereas it was 2 in. on the previous model; the bearing lengths were $3\frac{1}{4}$, $2\frac{1}{2}$ and $4\frac{1}{16}$ in., front, center and rear, and on the new model they are $2\frac{7}{8}$, $2\frac{3}{8}$ and $4\frac{1}{16}$ in. respectively. A somewhat lighter flywheel is used because of the flywheel effect of the compensators and the larger crankshaft. The connecting rod bearings are now $2\frac{3}{8}$ in. diameter and $2\frac{7}{8}$ in. long, while on type 61 they were of $1\frac{7}{8}$ in. diameter and $2\frac{3}{4}$ in. long.



Left—New Cadillac crankshaft. Right—Former Cadillac crankshaft

The valve drive is essentially the same in principle as in the previous model. The camshaft and fan shaft are driven by Morse silent chain, but the installation has been improved by using the latest type of Morse chain and by increasing the width by $\frac{1}{4}$ in. Owing to the better wearing qualities of the new chain and the increased width, together with the smoother crankshaft rotation, it has been found that an adjustment on the chain is unnecessary, and this has been dispensed with. The camshaft sprocket is now a single type instead of double and is keyed to the camshaft.

Valve System Altered Slightly

The valve system has not been materially altered. The tungsten steel valves, giving a 1 11/16-in. diameter opening, are operated from a single camshaft through rocker arms suspended from the upper crankcase cover plate. The hollow camshaft, however, now has 16 instead of 8 cams, each valve being operated by an individual cam. The valve rocker arm and plate assembly has been redesigned to conform to the new camshaft. Additional supports are provided for the rocker arm shaft, so there is a support on each side of each rocker arm, making a more rigid assembly. The new firing order is 1-L, 4-R, 4-L, 2-L, 3-R, 3-L, 2-R, 1-R. The valve timing remains the same, the exhaust opening at 46 deg. 40 min. ahead of lower center and closing on upper center. The intake opens at upper dead center and closes 46 deg. 40 min. after bottom center.

The fuel and carburetion system is practically the same as on the previous model. Pressure feed from a 20 gal. gasoline tank is continued. The tank itself has been improved in two details. The gage is placed in a more convenient location at the left end of the tank, and the gasoline and air connections are in more accessible positions on the front side of the tank, with ample clearance below the frame cross member. The carburetor is the same as previously used, but a single drain pipe passing between the two center cylinders on the right side has been substituted for the multiple drain pipe previously used. This renders the valve adjusting parts more accessible. The exhaust heated intake manifold is continued, but the flanges for the connections to the cylinder block are placed parallel to the cylinders instead of vertical. This makes it unnecessary to spring the manifold while removing and replacing it and tends to insure tight joints.

The Cadillac Delco type ignition system is continued. The conduits inclosing the ignition cables are now supported by bosses cast in the blocks instead of by brackets fastened to the cylinder head nuts. This renders it unnecessary to disturb the cable conduits when removing the cylinder head. The coil is now completely inclosed in molded Bakelite, making it weatherproof. The high tension terminal has been removed from the rear side to the top of the coil and is protected by the Bakelite casing.

Except for minor improvements the cooling system remains the same. The radiator condenser is located further toward the rear and is suspended in a vertical position, so that the incoming vapor will pass through a greater depth of liquid. There is no longer any need for filling the condenser through the floor boards; the operation is now automatic, the water which flows into the overflow pipe on filling the radiator entering the condenser. The two centrifugal water circulating pumps are driven by a helical gear from the crankshaft and contain thermostatically controlled valves as formerly.

Engine lubrication remains the same, but a larger and more convenient oil filler is provided, bringing the opening above the hose connection between the radiator and

the engine. The filler is provided with a hinged instead of a threaded cap and has a larger strainer. The oil level indicator has been improved by eliminating the glass and thus insuring permanent visibility of the indicator ball.

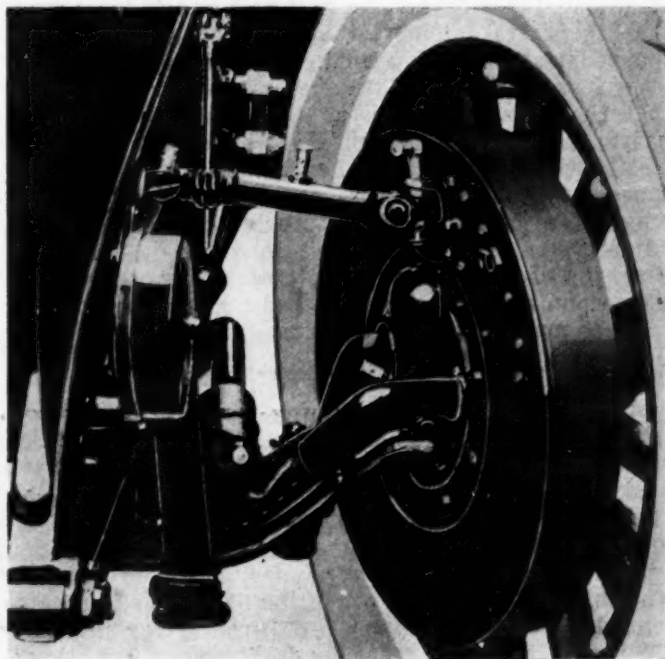
No important changes have been made in the power transmission units. A minor change has been made in the gearset, to provide for the operation of the back-up light switch when the transmission control lever is put in reverse position. The transmission gear tooth surfaces which engage in intermediate gear and direct drive are finished by a grinding process, for quietness. The rear axle is practically the same as that used on the later type 61 cars.

The frame has side bars of the same dimensions as in the previous model, but two additional cross-members have increased its stiffness. One of these cross members, tubular in form, is placed a short distance behind the gearset. The other is of channel section and located at the front ends of the rear springs. The artillery type wheels with steel felloes and twelve hickory spokes are similar to those on the previous model. The steering gear now gives a slightly increased ratio between the steering wheel and the sector shaft for easier steering. An adjustable packing gland has been placed at the upper end of the steering column to prevent overflow of lubricant if too much has been injected. The oil hole for lubricating the bushing at the upper end of the column has been relocated, enlarged and provided with a plug.

Front Axle Redesigned

The front axle has been entirely redesigned and strengthened to provide for the additional stresses imposed by the front wheel brakes. It is of the reverse Elliott type. The tie rod is behind the axle and its joints are of the ball and socket type as required with inclined knuckle pivots.

The Cadillac four-wheel brake arrangement is an adaptation of the Perrot system as used on other General Motors cars. The layout, however, is somewhat different as regards the distribution of braking effect between the front and rear brakes. The braking system consists of three pairs of brakes. The service brakes,



Close-up view of front wheel brake mechanism

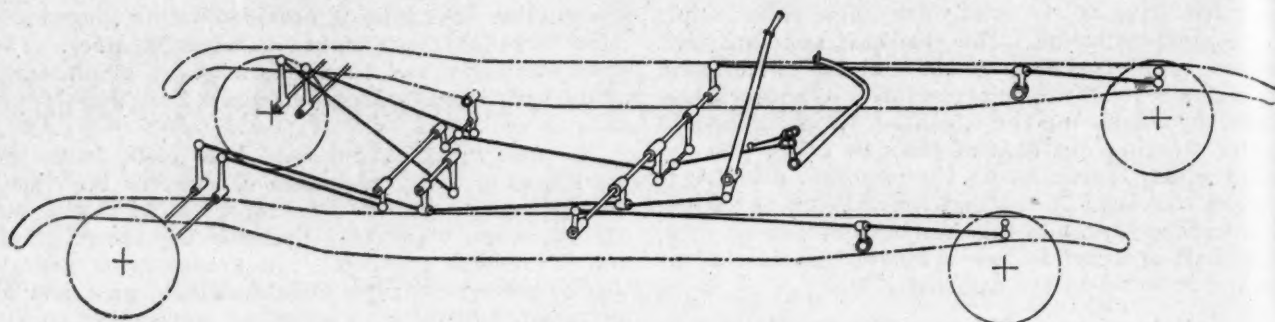


Diagram showing connections of four-wheel brake system

which operate on all four wheels simultaneously, are external on the rear wheels and internal on the front. The emergency or hand brakes are internal on the rear wheels. The hand brakes are independent of the foot brakes in all particulars.

Four-Wheel Brake Design

The four-wheel brakes are so designed that when the brakes are applied with the steering wheel turned to the right or left, only the brake on the inner wheel will take effect, leaving the outer front wheel free to rotate. Similarly, if the car is sliding straight ahead on a slippery surface with both front wheels locked and if the steering wheel is then turned, the outside front brake will automatically release. The braking effects are so proportioned that the front wheels will not lock until more than enough pressure has been applied to lock the rear wheels. The proportion of the braking effect taken by the front wheels can be adjusted within limits to meet the requirements of different loads or to suit individual preference.

The four-wheel brakes are applied by a pedal which connects through a pull rod to a division bar which performs the function of graduating the braking effect of the front and rear brakes. The division bar is connected by levers to the front and rear cross-shafts which in turn are connected through levers and pull rods to the front and rear brakes. The pull rod connecting the brake pedal to the division bar has two engaging eyes. The first eye is nearer the pedal shaft and consequently has a greater leverage than the second. The connections are so adjusted that during the first part of the pedal travel the brakes are applied through the connection nearest the pedal shaft, giving application of the brakes with light foot pressure. When the brake lining is worn, so that the pedal is within a short distance of the toe board, the upper connection takes effect and the rate of pedal travel is reduced. The result of this two-stage construction is that the brakes can be used for a much longer time before the pedal touches the toe board and adjustments are needed less frequently. At the same time, the change in leverage denotes to the driver that the second stage has been reached and that adjustments must be made in the near future.

Highly Compressed Brake Lining Used

A special type of brake lining which is highly compressed and subjected during manufacture to a heat treatment, has been adopted. Before assembling the brake band on the axle, the lining is machine-burnished to take off the surface bloom and consequently give a longer wear before adjustment is necessary. All four brake drums are of the same size, 17 in. in diameter. The three sets of brakes are of the flexible band type designed to permit the lining to conform to any slight distortion of the drums resulting from heat.

The rear wheel external brakes are essentially the same as in the corresponding brakes on former Cadillac cars. The toggle lever and anchor, however, have been moved to lower positions on the brake bands to give a greater length of the band above the drum. This increases the wrapping effect of the upper part of the band and is another factor in making the rear brakes more effective than the front, which are of the expanding type. A stop screw has been added above each external brake to preserve a uniform clearance throughout the increased length of the upper part of the band. The anchor adjusting screw has also been made self-locking.

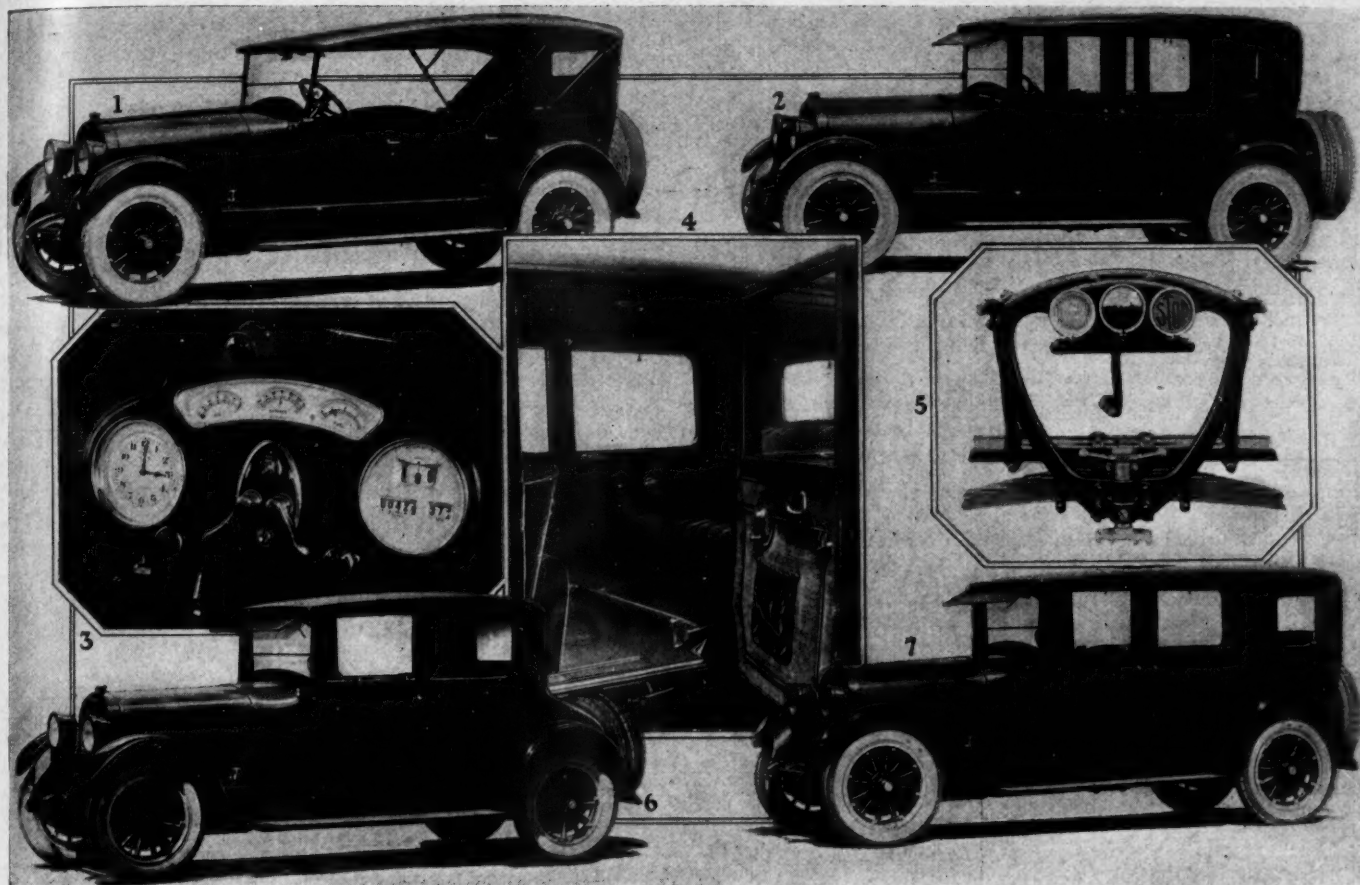
The front internal brakes are of the expanding toggle type, similar in principle to previous rear wheel internal brakes but differing in the method of application. As in the external brakes, the location of the anchor in relation to the toggle makes use of the wrapping action. Provision has been made for protecting the front wheel brakes from the weather. The brake drum overlaps the edge of the dust shield in an angle-shaped projection to automatically catch and throw off any water or dirt which may pass the dust shield.

The equalizer for the rear wheel brake is suspended from the frame cross-member opposite the front end of the rear springs. It is so located that the rods between it and the brakes pivot about approximately the same axis as the rear springs. A rocker shaft for the rear wheel internal brakes is provided on the same cross member to which the rear wheel external brake equalizer is attached.

Eleven Body Styles

Eleven body styles, all of which are new but similar in general characteristics to previous Cadillac bodies, have been designed for the type 63 chassis. Generally, the bodies afford more leg room, side room and head room, both in the open and closed models. In the closed bodies a particular improvement is in the front door post which is of special design to permit greater vision for the driver. Another new feature on the closed bodies is the two-piece ventilating windshield which also affords better vision than the previous model. The division between the front and rear compartments of the chauffeur-driven cars—the Imperial suburban, Imperial sedan, open limousine and town brougham—now extends across the full width of the car and allows for the lowering of the special curved glass. The plate glass in all closed bodies is 7/32 in. thick and of mirror finish. All of the doors are of the flush type, and butt-walnut veneer panels in matched sets are used on the inside of the doors. The walnut molding, mohair finishings trimmed in panel effect and tufted pockets are features of the doors on the closed bodies of the entire line.

The window lift handles on the front doors are now located so that they do not interfere with the driver's hands while he is operating the car. Silk roller curtains



1—Seven-passenger phaeton. 2—Five-passenger sedan. 3—New instrument board arrangement. 4—Interior of Suburban model. 5—Triple rear light combined with tire carrier. 6—Five-passenger coupe. 7—Seven-passenger Suburban

are now carried on the body header above the doors rather than on the doors themselves. The rear seats of the closed models have been improved for riding qualities by making them more nearly the lounge type, and the horizontal cushion is made to fit underneath the back springs in such a way that it causes the shape of the back and the seat to conform more naturally with the occupant's position. There is also a rubber-padded arm rest for the occupants of the rear seat. The roof is soft and of slat construction to deaden sound. The upholstery and interior trimmings are a new line of velvet mohair made from the first carding of goat hair. In the Imperial suburban, open limousine and town brougham, an additional eight-day clock is mounted above the division window for the rear seat passengers. The closed body line consists of a two-passenger coupe, five-passenger coupe, Imperial sedan, seven-passenger suburban, Imperial suburban, open limousine and town brougham.

The open bodies, of which there are three, are the roadster, phaeton and touring car. Nineteen gage steel is used in constructing the doors of all the open models this year. The doors are opened and shut from the inside by flush type handles. Ventilating curtains are provided for all doors and a special metal door stop is used for the first time. The stop has an adjustable rubber bumper to prevent rattles. The tonneau floor is constructed to reinforce the entire rear end of the body and the front seat construction is more rigid. Pivot pins in the auxiliary seat are now designed to take up all play in the auxiliary seats and brackets to prevent rattles. A large tool box built in the right-hand dust shield contains all the hand tools in a separate compartment, while the larger tools and equipment are

held in place by spring clips. The tool box is equipped with a key lock.

In the roadster, two extra passengers may be accommodated in the cushion-back auxiliary seat placed beneath the rear deck. There is a combination door and step on the right side of the car, which opens into a compartment where golf bags, week-end bags or small parcels may be carried. The phaeton now has a new trunk support fastened with concealed screws and in the touring car the width of the rear seat has been increased from 45 to 46 in.

Centrifugal Forces in Engine Are Inherently Balanced

The centrifugal forces in all Cadillac multi-cylinder engines preceding the 63 model engine are inherently balanced and produce no vibration. The reciprocating forces in the conventional eight-cylinder engine as previously employed are not in inherent balance.

Figs. 1 to 6 on page 520 show how the reciprocating forces of the Cadillac 63 engines are balanced. The reciprocating forces are the forces required to alternately accelerate and retard the speed of the pistons and a portion of the connecting rods. The force required to accelerate or retard any piston and rod acts in the axis of the corresponding cylinder and reacts on the main bearings of the crankshaft, alternates in direction and varies in intensity according to the formula under Fig. 1. The value of any of the forces in any of the figures is obtained by multiplying $\frac{WV^2}{gR}$ by the decimal number given on that force line.

Fig. 3 shows the direction and the relative intensity of the reciprocating forces for any piston and rod in the

$$\text{RECIPROCATING FORCE} = \frac{WV^2}{gR} \times (\cos \omega + \frac{R}{L} \cos 2\omega)$$

WHERE V=LINEAL VELOCITY AT CRANK PIN IN FT. PER SEC.
R=RADIUS OF CRANK ARM IN FEET
L=CENTER TO CENTER OF CONN. ROD ENDS IN FEET
W=WEIGHT IN POUNDS OF RECIPROCATING PARTS
g=FORCE OF GRAVITY (-32.2 * APP.)

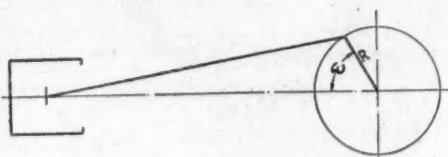


Fig. 1

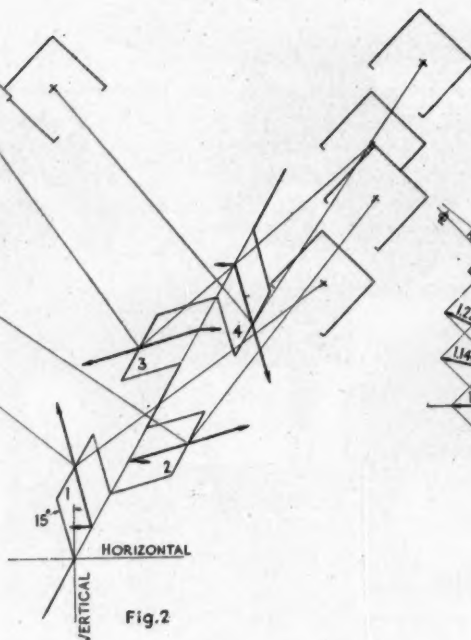


Fig. 2

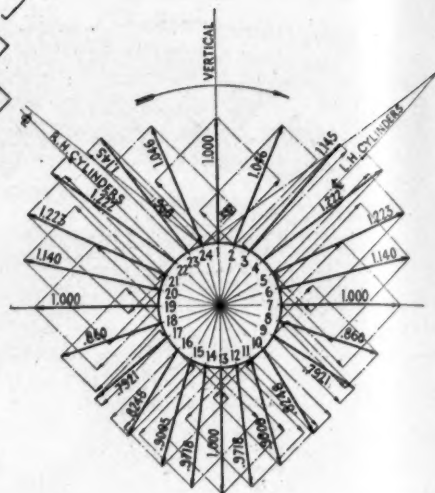


Fig. 5

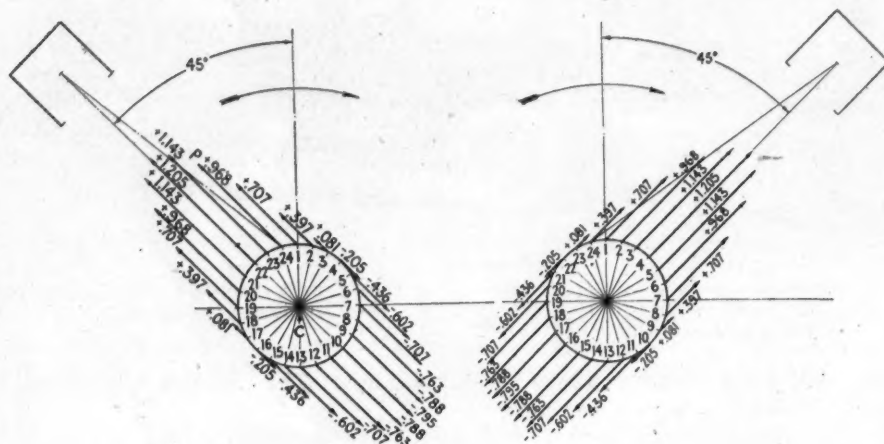


Fig. 3

Fig. 4

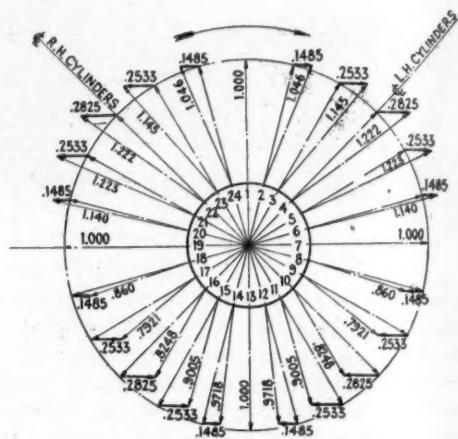


Fig. 5

right hand block of the Cadillac 63 engine for all crank positions at intervals of 15 deg. The force for any crank position shown reacts upon the crankshaft bearings 6 in the axis of piston travel but for convenience is shown in relative intensity and direction by the line and arrow at the crankpin. For the position of piston and rod shown, the line *p* represents the direction and intensity of the reacting force in the axis of the piston travel upon the crankshaft bearings, tending to produce vibration. It will be noted that while always acting in the axis of the piston travel, the forces vary in intensity for various position of crankpin.

Piston and Rod Information

Fig. 4 gives the corresponding information for any piston and rod in the left hand block.

Fig. 5, in heavy lines, shows the resulting forces formed by combining the separate forces produced simultaneously by right and left hand pistons and rods connected to any one crank. Thus, at 24, Fig. 5, is shown in faint lines the direction and magnitude of the two forces as given for crank position 24 in Figs. 3 and 4. The force for the right hand rod and piston is given as .968 and the force for the left hand block is given as .397. The resultant of these two forces is given as 1.046 (Fig. 5). It will be noted that with the exception of the horizontal and the vertical

crank positions none of the resultant forces are in a radial line.

Radial Component

Fig. 6 is developed by resolving each of the resultant forces in Fig. 5 into radial and horizontal component forces. It will be noted that the radial component of the reciprocating force remains constant in intensity for every position of crank during a complete revolution and that only the horizontal component varies in intensity and direction.

Fig. 2 shows the angular relation of the four cranks of the Cadillac 63 crankshaft with crank No. 1 shown 15 deg. to the left of a vertical plane, corresponding to crank position 24 in Fig. 6. Crank No. 4 is 180 deg. from crank No. 1, corresponding to crank position 12, Fig. 6. Crank No. 2 is 90 deg. to the right and crank No. 3 is 90 deg. to the left of crank No. 1, corresponding to crank positions 6 and 18, respectively, in Fig. 6.

Upon inspection of Fig. 6 it will be seen that the radial component of the reciprocating force corresponding to crank No. 4 (position 12) is in the same plane as but opposite in direction to the corresponding force for crank No. 1 and is separated from the latter force by the axial distance between the centers of crankpins Nos. 1 and 4 (see Fig. 2). It will be seen also that the horizontal com-

ponent forces corresponding to these same two cranks are identical in intensity and direction and are separated by the same axial distance as the radial component forces.

Similarly for cranks Nos. 2 and 3, corresponding, respectively, to positions 6 and 18, the radial forces are equal in intensity and opposite in direction, and the horizontal component forces are identical in intensity and direction, and each of these two pairs of components are separated axially along the shaft by the distance between the centers of cranks Nos. 2 and 3.

It will be noted further that the horizontal component forces for cranks Nos. 2 and 3 act in the opposite direction to the corresponding forces for cranks Nos. 1 and 4 and that all are equal in intensity. Recalling that the horizontal component forces are indicated out of their true position, for convenience, and that in reality they act through the axis of the crankshaft bearings, and that the center of gravity of the horizontal component forces for cranks Nos. 2 and 3 coincide with the center of gravity of the horizontal component forces for cranks Nos. 1 and 4 for the positions mentioned, it is evident that these horizontal components of the reciprocating forces are balanced.

Vibration Reduced

Upon further inspection of Fig. 6 it will be observed that for every angular position of crankshaft the horizontal component reciprocating forces corresponding to

cranks No. 2 and 3 are equal and opposite in direction to the corresponding forces for the other two cranks. Since the center of gravity of the forces for cranks Nos. 2 and 3 coincides with the center of gravity of the forces for the other two cranks for every angular position of crankshaft, they always balance and therefore can produce no vibration.

Couples Eliminated

The radial components of the reciprocating forces for cranks Nos. 1 and 4 always act in the direction of their respective cranks and produce a couple in the plane of these cranks. Likewise a couple is produced in the plane of cranks Nos. 2 and 3. These couples tend to produce vibration. This tendency can be nullified by providing a counterweight diametrically opposite each crankpin. To facilitate practical construction these weights may be divided and applied to the prolongation of the cheeks adjacent to the crankpins.

The cheeks, crankpins and lower end of rods produce centrifugal forces. These forces may be balanced completely by increasing each of the above weights by the proper amount.

Thus the reciprocating and centrifugal forces in the Cadillac model 63 engine can be balanced by means of properly proportioned counterweights. Counterweights are omitted from the two intermediate cheeks and their equivalent is added to the remaining weights.

New Stroboscopic Instrument for Studying High-Speed Motion

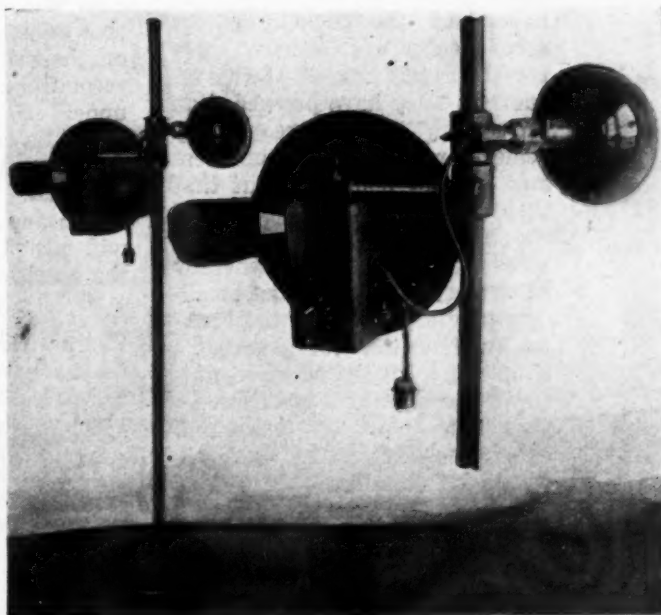
An optical instrument called the Rotostat, for studying the motion of high-speed mechanisms, has been developed by the Rotostat Instrument Co. It makes high speed machines appear to stand still or move slowly so that their parts may be studied at leisure. Ordinarily, no exact knowledge is possible of what takes place when mechanisms run at high speeds, as examination of their parts when stationary or slowly moving is frequently misleading, such factors as centrifugal and inertia forces, errors of balance, windage, etc., becoming serious only when high speeds are reached. The requirements of easy visibility and of practical operating speeds do not harmonize. The rotostat is claimed to make possible clear and comfortable observation of the action of the machine elements while actually operating at full speed.

In the development of automobile engines and their appurtenances, the Rotostat can be used for such work as the study of cam gear action, of torsional vibration of the crankshaft, of the action of ignition contact breakers, etc.

In principle, the Rotostat is a motor-driven stroboscope. A hood, fitting the face, is provided, in the front of which is an aperture eclipsed by a pierced shutter. The latter is motor-driven, and its speed is controlled by the turning of two knobs, one for coarse and the other for fine adjustments. When the speeds of the shutter and the observed object are exactly equal, the latter appears to stand still. When the shutter runs faster or slower, the object appears to move at a rate equal to the difference in speeds.

The entire mechanism and all electrical parts are enclosed in an aluminum case formed in one piece with the hood. A stand with a heavy base is provided so that the instrument may be set in position, leaving the hands free for operating and adjusting the machine, or for tak-

ing notes. Mounted on the stand is an adjustable reflector and lamp for illuminating the object. No storage batteries, special lamps, or extra electrical equipment are necessary. Since the device is motor driven, no attachments to the machine are required. This is convenient where the instrument is to be used in general work on a variety of machinery. A valuable feature of the Rotostat is claimed to be its simplicity of operation. After connecting to a 110-volt lighting circuit, the entire manipulation consists of turning the knobs until the desired object speed is obtained.



Just Among Ourselves

"Collins Six" Soon Will Join Forces with Peerless

WHEN R. H. Collins left the General Motors organization, expecting to join forces with W. C. Durant, he developed a six-cylinder car which was to be called the Collins but would have been a part of the Durant line. Before manufacturing plans had been completed he had an opportunity to acquire control of Peerless and disposed of most of his stock in the Durant enterprises. In the relatively short period which has elapsed since then he has brought Peerless out of a deep hole and has turned a heavy loss into a profit. Now, it is understood, he expects soon to begin production of the Collins as a companion to the Peerless. It will be a six-cylinder job and it is reported that it will be in the same general price class with Buick and Studebaker. The lower-priced car will give Peerless dealers an opportunity to go after business which they are not now able to get.

Dealer Accounting System to Be Installed by Experts

EXECUTIVES of the National Automobile Dealers Association have plugged ahead steadfastly in the past six months and have laid the foundation for some really constructive work for the retail branch of the industry. They have proceeded on the theory that a great many dealers are not as good business men as they should be but that they can be educated. One of the big steps in this direction will be an arrangement whereby expert accountants in the smaller cities and towns of the country will install for dealers a simple but highly effective uniform accounting system designed to plug up leaks and enable the dealer to know exactly where he stands. The cost of this system will be nominal and

it is so simple anyone can operate it. The association will start the work immediately in 250 cities and it will be expanded as rapidly as possible. Most of the men engaged thus far to install the system are certified public accountants while the remainder are employed in banks.

Cooperative Used Car Sales Plan Devised by N. A. D. A.

MOST of the educational work which has been done thus far in connection with the used car problem has had to do with "buying 'em right." Until very recently that was the crux of the situation. Owners were setting the prices they wanted for the old goods and the dealers were paying them so they wouldn't lose sales. Most of them have learned the folly of this course, however, and now they are paying only what they think the car is actually worth. Much remains to be learned, nevertheless, about merchandising used cars at a profit. That is another work the N.A.D.A. has undertaken. It has worked out a cooperative merchandising plan which will help the members of local dealer associations actually to make money on their used cars. This plan will be based on the theory that no used car should be placed on the market until it has been reconditioned and then only under a guarantee. Impetus would be given to sales by means of cooperative advertising. The N.A.D.A. will supply all the forms and advertising copy and will provide experts to set up the machinery.

Competition for Dealers Grows Keener Constantly

NOTWITHSTANDING the amazing demand for automobiles there is a dearth of dealers. Although practically all companies are attempting to en-

large their sales organizations by bringing new men into the field, it must be confessed that their efforts have not met with much success. The only answer seems to be education of men who have been indifferent merchants up to this time but who have some knowledge of what is necessary to sell motor cars. Most companies are planning for increased production next year and to get this larger output it will be necessary for them to expand their dealer forces. This means keener competition than ever before for dealers. It means also that those companies which fail to make it possible for their representatives to make a decent living will suffer in the long run. The man with selling ability has no difficulty in getting almost any franchise he wants if he desires to shift. It behooves companies which are seeking large production, therefore, to keep constantly in mind the best interests of the dealers. In the last analysis, their interests are identical.

Knocking Rival's Products Doesn't Aid Car Sales

WHILE manufacturers are struggling keenly for good dealers, the dealers themselves are battling just as intensively for business, especially those handling closely competing lines. Their methods are not always beyond reproach. A Brooklyn dealer for one company, for example, recently added a 1924 model of the most closely competing line to his used car display. When someone tried to buy it, however, it was not for sale even at list price. A Milwaukee dealer recently used considerable advertising space to announce that a 1924 model of a rival car had been traded in for one of his own after being driven only 11 miles. Such perverted sales methods are of about as much interest to the

More or Less Pertinent Comment on Topics of Current Interest to Men in the Industry

public as the squabbles between competing newspapers. Motor cars must be sold on merit and not by knocking the other fellow's product. If there are dealers who don't realize this they should be educated by their factories.

Why Not Teach Buyers How to Drive Their Cars?

STATE after State and city after city are adopting more rigid driver's license requirements in the interest of public safety. The industry contends, and rightly, that this is not the best solution of the safety problem but there undoubtedly is some justification for the steps being taken. The police traffic bureau in Detroit recently put into effect an examination with teeth in it. The result was that 250 applicants were turned down the first day, the majority because of their ignorance of city traffic ordinances. A few were found to have defective vision and a few were just naturally dumb. While the industry cannot always reach the buyer of the used car, dealers should feel an obligation to teach first buyers enough about driving so they can pass such examinations without difficulty. This would tend to prevent the adoption of even more stringent regulations. The time has come for factories to impress upon their dealers the fact that unless the accident hazard is reduced sharply there will be a serious reaction on sales. The industry can't afford to remain indifferent to this problem.

New England Is Clinging to Custom Body Building

BACK in the days of the horse, New England claimed supremacy in coach building but it made no attempt to attain quantity production. When carriages became passé except for

those who worshipped the old order, the New England coach makers turned their attention to the newfangled automobile and they turned out some high class custom work. They still do, but the Middle West became the real center of the body building industry because it was readier to grasp a new idea. It learned easily the principles of quantity production while New England followed in the footsteps of old England in this respect. It always has and always will do high class work but it never will be a big producer of bodies. The custom plants up there have few labor troubles, however. Just as the factory passes down from father to son, so sons follow their fathers in the plants. They don't look down on the gray-beards either, for some of the old fellows, well past sixty, are counted the best men in the shop and to them is assigned the task of taking the bugs out of new jobs before they go into production.

Selling "Big Boss" on Body Lines Is Often Tough Job

BODY builders sometimes get peevish because of what they think are the freak ideas of body engineers employed by automobile companies. Their grouch is not always unjustifiable but they should remember that the body engineers at the factories have their own troubles. Not the least of these is the necessity of selling the "big boss" on a design based on sound mathematics and good engineering. The chief may be rather prone to admit that his own notions always are right. It is quite possible he has rather decided views on what a body should look like although it may be purely a personal notion. There is the historic incident of the manufacturer of the high grade car, who was unusually short in stature but who insisted

on having the bodies on his cars built to fit himself, ignoring the fact that a taller driver had to sit with the wheel between his knees. On the other hand, there is the Massachusetts body builder who insists that the rear seat in a sedan should be built like an arm chair. He also demands upholstery on the bottom of the front seat so he won't slip, when he drives, and leather on the back so he can slide up and down.

Motorcycle Maker Shows Genuine Moral Courage

UNDER the caption, "Confession is good for the soul," the Hendee Mfg. Co. is using large advertising space to announce that never again will it advertise any performance with an Indian motorcycle which is directly or indirectly in violation of the law and that it will do everything within its power to discourage efforts to establish cross country speed records which must, of necessity, violate State and municipal statutes. This statement is brought forth by the fact that the company gave publicity to the exploit of Paul Ramaley in establishing a new speed record from the Mexican to the Canadian border on an Indian machine. This feat brought a rebuke from chief inspector of the Oregon traffic division and the Hendee company has had the moral courage to admit he was right in condemning the exploitation of a speed record made in violation of the laws of three States. Racing should be confined to race tracks. It has no place on public highways unless they are set aside specifically for that purpose. The automotive industry has done well to recognize that fact and the Hendee company is to be congratulated upon the courageous stand it has taken.

J. D.

Labor Costs Halved by Use of Duco in Finishing Oakland Bodies

Can complete in one day job which formerly required seven to nine days. Saving in floor space and other economies have about doubled plant capacity. Blue now employed, but unlimited range of colors is available. Durability has been proved by severe tests.

By W. L. Carver

OUTSTANDING economies are effected by the use of Duco Finish in the Oakland open body paint shop. The saving in time, labor and floor space following the adoption of this finish makes possible the production of 300 bodies per day in the same plant that was formerly pushed to the limit on a schedule of 175 bodies. This increase in capacity is accompanied by a substantial decrease in labor requirements. There is now floor space to spare. Handling is reduced to a minimum and all operations from the receiving platform to the final assembly line proceed in a smooth continuous manner.

Hand in hand with these manufacturing advantages are the favorable characteristics of the finish. Although this company has adopted two shades of blue for the current models, an unlimited range of color selection is available. The finish is finally obtained by a rather brief process and has the characteristics of hard baked black enamel in durability, gloss and permanence. Heretofore any variation from black, which could be enamelled and baked on, required a lengthy varnishing process which necessitated careful handling by the shop workers and the ultimate owner. Duco is an air drying enamel with all of baked enamel's resistance to the action of mud, water, temperature changes and either alkalines or ordinary acids.

Preliminary Preparations

In the Oakland plant, preparation for the application of Duco is, with but minor exceptions, similar to the former treatment of bodies preliminary to varnish finishing. Bodies are received at an open platform on the first floor and are then given a thorough inspection. Any slight defects or damage, such as dents, incurred in shipment are bumped out by the hand process during inspection or the first operation. The bodies are then put on carriages and delivered to the second process which is a cleaning operation. Deoxidine, which consists largely of alcohol and phosphoric acid, is brushed on all the exposed metal surface by hand. After brushing with steel wool to remove all rust, scale and grease, the body is washed off with boiling water. An asphalt floor surface is laid in the bay where the cleaning is done as Deoxidine will attack either wood or concrete.

Although the unit cost is said to be somewhat higher than that of sand-blasting for the same purpose, this operation has been found to be more economical in the long run. The greatest objection to sand-blasting was the labor turnover resulting from the unpleasant nature of the work. The present process is in no way injurious to the worker and is performed in an open, well lighted bay. Also, Deoxidine tends to prevent rust or corrosion for a period of ten hours while a sand-blasted finish will begin to rust almost immediately. In fact, the ultimate finished surface

may be ruined locally by the mere contact of a man's hand with the sand-blasted surface before the priming coat. This feature is of great importance as the first requisite of a well finished body is an absolutely clean base surface.

A red oxide primer is then sprayed on as the third operation, the carriage with the body having been run into a spray booth. Following the application of the primer, the body is placed in a conveyor oven where it remains for 1½ hr. at a temperature of 300 deg. Fahr. A battery of oil-fired ovens is used for this work. The burners heat the air which is circulated through the ovens by blowers.

Putty Glazing Operation

The fifth operation is a putty glazing, carried out at the delivery end of the first battery of ovens. All slight defects, such as small dents and scratches are filled at this point. The putty glazer is applied locally by hand as required. No drying time is allowed after this operation, as the bodies are delivered immediately to a spray booth for the application of the sand surfacer which constitutes the sixth operation. To expedite the work at this point and insure a good finish, a putty glazer and sand surfacer of the same physical and chemical characteristics are used. This being the case, both dry at an equal rate and with an equal rate of contraction while hardening. As applied on top on any putty glazing, the sand surfacer serves to build up the entire surface of the body so that it may later be rubbed to a smooth base for the finishing coats.

Following the application of the surfacer, bodies are again placed in another section of the battery of ovens for 1½ hr., at the same temperature, 300 deg. Fahr. As the solvent or thinner used with Duco is amyl-acetate which is the base of many paint removers, this high temperature and time period in the ovens is maintained to insure complete oxidation of the linseed oil in the preliminary coats.

Sanding Operation

Sanding, the eighth operation, is done progressively on a conveyor line parallel with the battery of ovens. The conveyor is built over a concrete drain floor. Each man is assigned a certain portion of the body and operations are grouped so that at least two men are engaged at each station without interference. All exposed portions of the metal body are rubbed with sand paper and flushed with water. Up to this point, the preparations of the body for Duco is practically the same as for the former varnish finish. The resemblance ceases here, however. With the Duco process, only a few simple operations remain.

In the ninth operation, the first coat of Duco is applied. The spray booth and air gun equipment formerly employed are used entirely. The job is taken from the end of the sanding line and run into the spray booth on the same

carriage and sprayed in the usual manner. A better finish is obtained by spraying from the bottom to the top of the job as Duco has not the flow characteristics of the customary varnish. As diffused by the air gun, drying begins almost immediately so that the job may be touched without damage by the time the body comes out of the spray booth. Following this operation the body is force dried in a steam heated oven for a half hour at a temperature of 125 deg. Fahr. An intermittent pneumatic-operated conveyor system is installed at this point. No particular heat insulating facilities or doors are required. The oven consisting of a light enclosure which houses the conveyor system and two banks of steam radiators.

Second Coat Applied

After leaving the conveyor, the second coat of Duco is applied at a duplicate set of spray booths. The material, in this case is exactly the same as that put on for the first coat and may be rubbed vigorously with no consequent damage as the body comes out of the booth. At present this coat, which is the last, is being air dried. The bodies are placed upon end in a small storage space adjacent to the spray booths. As production demands, however, it is planned to return the bodies to the forced drying enclosure for another period of one-half hour at 125 deg. Fahr.

In order to improve the luster, the bodies are then moved to a rubbing bay where they are rubbed down with boiled linseed oil, rotten stone and Manning 320 speed-grit cloth. At the conclusion of the rubbing operation they are wiped off with any ordinary rag. The hardness and durability of the finish are demonstrated by the fact that any rag such as usually supplied or even a piece of burlap may be used with every degree of safety. No improvement in durability is made by this operation. It is stated that the same finish would be acquired by the customer after one or two washings if the rubbing operation were eliminated entirely.

After leaving the rubbing bay, the body is striped by hand in the usual manner with japan color and then proceeds on a roller conveyor to the trim shop. The body then passes over the progressive trimming line to the head of the inclined conveyor which connects with body storage in conjunction with the final car assembly line.

It is evident that the work of finishing the body is greatly simplified as a result of the characteristics of this finish. A tabulation of the progress of the body through the plant when finished with Duco and then in accordance with the former methods of producing a color finish will emphasize the simplicity and directness of the new method. As the two are similar up to and including the eighth operation, but one tabulation will be made to that point.

Painting Operations with Varnish or Duco

- 1—Inspect and correct slight defects.
- 2—Clean.
- 3—Spray primer coat.
- 4—Oven dry, 1½ hr. at 300 deg. Fahr.
- 5—Putty glaze.
- 6—Spray on sand surfacer.
- 7—Oven dry, 1½ hr. at 300 deg. Fahr.
- 8—Sand surface.

Final Operations with Duco Finish

- 9—Spray first coat of Duco.
- 10—Dry ½ hr. at 125 deg. Fahr.
- 11—Spray second coat of Duco.
- 12—Air dry or force dry ½ hr. at 125 deg. Fahr.
- 13—Rub.
- 14—Stripe.
- 15—Wax stripe.
- 16—Deliver to trim shop.

Final Operations with Varnish

- 17—Spray on ground coat.
- 18—Dry 1½ hr. at 200 deg.
- 19—Light sanding operation.
- 20—Spray on color coat.
- 21—Dry 1½ hr. at 200 deg.
- 22—Brush on color varnish.
- 23—Air dry 24 hr. or air dry 5 hr. and force dry 12 hr.
- 24—Brush on second coat color varnish.
- 25—Air dry 24 hr. or air dry 5 hr. and force dry 12 hr.
- 26—Deliver to trim shop.
- 27—Return after trimming.
- 28—Rub.
- 29—Stripe.
- 30—Final clean up.
- 31—Brush on finish varnish.
- 32—Air dry 24 hr.

From a manufacturing standpoint, the decrease of 33 per cent in the total number of operations following the use of Duco is overshadowed by the elimination of three 24-hr. drying periods. Two of these periods can be reduced to 17 hr. by the means of force drying, but are still outside the time range required for Duco finishing. Of practically equal importance is the reduction in handling which is brought about by the fact that bodies are now delivered to the trim shop after they are completely painted instead of being returned to the paint shop for the final finishing operations after having been trimmed. In addition to the extra handling, the former method required storage capacity at both sides of the trim shop for bodies that were still in process, whereas bodies now leaving the trim shop are ready for the final assembly line.

Formerly, much time was lost in protecting the upholstery during the final rubbing and brushing operations. Now the upholstery and trimming are installed with no particular precautions for the protection of the finish. In fact, any slight indentations which may be accidentally formed during the progress of the body through the shop are bumped out by hand during the clean-up operation in the trimming line with no damage to the finish.

Capacity Increased

Although this plant was formerly pushed to the limit in producing 175-200 bodies per day, ample capacity for 300 bodies per day is now available. It is stated that under pressure the plant could be made to produce 400 bodies per day with no let-down in the quality of finish upon each individual job. This increase in capacity is demonstrated by the fact that when necessary, a body can now be completely processed from the receiving platform to the final assembly line in one working day. In other words, a raw metal body which is delivered at the receiving department in the morning can leave the plant on a finished car the same evening. Formerly, from seven to nine days were required for the finishing of a color job.

Due to the elimination of a great amount of handling and the smooth progress of the body through the shop in addition to the much smaller number of simpler operations, labor requirements are greatly reduced. When organized on a varnish basis, 170 men were required for the production of 175 bodies per day. With the present arrangement and using Duco finish, it is estimated that 150 men will turn out 300 bodies per day and the addition of a very few more men will bring the output up to 400 per day when required. Not allowing for the higher pay of skilled varnish brushers, the unit labor cost per body is reduced by nearly 50 per cent.

Some interesting side-lights are found in the practical experiments which were carried on by the Oakland paintshop prior to the adoption of Duco. Six open car doors were finished in various ways and placed on the roof of the factory late in November of last year. These doors were permitted to remain there all through the winter season, the break-up at the beginning of spring and the alternate rains and sun of the early summer and were removed for inspection a few weeks before the adoption of Duco as the standard open body finish. Among the others, one of these doors was finished with Duco after the manner already described. Another was finished in the same way with the addition of a coat of finishing varnish. The remaining four were finished in accordance with the former practice of this company. Upon inspection, the door finished with Duco was found to be only one that did not show the effects of the weather to a marked degree. This door, if anything, showed an improvement over the original luster after polishing. The varnish on the other Duco-finished door was badly

decomposed, but the underlying finish was in excellent condition and after the application of varnish remover was polished to a lustrous finish.

Another test was made by striking a Duco-finished panel with a hammer. In practically all cases the finish flowed with the indentation and could later be bumped out and restored by polishing. Matches were scratched on the finished surface and the scars removed by wax-polishing. Plaster was thrown against the panel and permitted to set and subsequently wiped off with an ordinary rag or rubbed off by contact with the hand. No destructive action was apparent and the surface was polished to a smooth luster. Paint or varnish removers of any other than an amyl-acetate base were permitted to stand for hours on the finished surface with no damaging effect. The permanence and durability of the finish were demonstrated by long application of pools of ammonia, muriatic acid and gasoline respectively, none of them having any apparent effect on the hardness of luster.

Air Pressure Regulates New Gasoline Gage

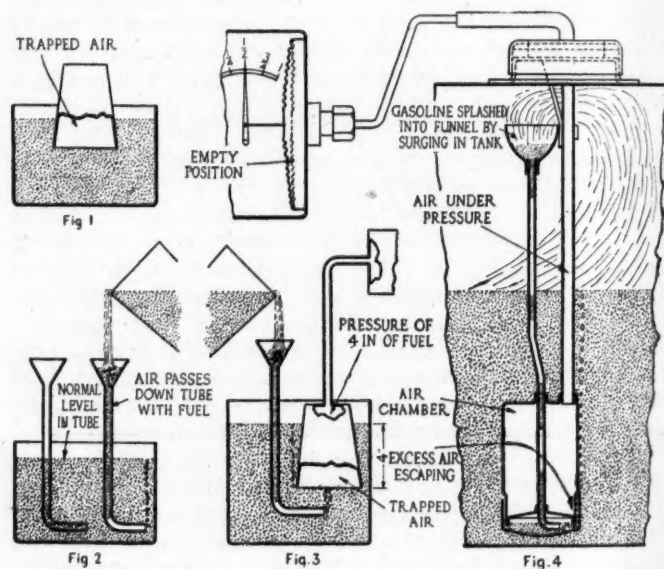
THE GASO SCOPE, a dash gasoline level gage manufactured by the Gaso Scope Corp., is now in use as standard equipment on several makes of cars and is said to be under trial by other manufacturers. This gage is actuated by the pressure created in air trapped beneath a bell in the gasoline tank, the pressure being proportional to the height of the liquid above the submerged bell. The pressure is utilized to extend a flexible diaphragm, and the motion of the center of the diaphragm is transmitted to an indicator hand showing the tank level. Air in the bell or trap chamber is replenished by bubbles carried into it when fuel splashes into a funnel at the upper end of a tube leading to the air trap.

The principal and actual construction of the Gaso Scope are illustrated in the diagram herewith. Fig. 1 illustrates a bell or glass inverted in the liquid. The glass traps the air which tends to prevent the liquid from entering. The liquid, seeking its own level, exerts a pressure on the confined air equal to the pressure of a column of the liquid extending from the rim of the glass to the surface of the liquid in the tank. The air pressure created in the glass bulges the flexible diaphragm, whose center moves a given distance for any given pressure. When a quantity of liquid is poured into a vessel already containing liquid it carries with it a quantity of air which is forced below the surface of the liquid into which the second liquid is poured. Fig. 2 shows diagrammatically the manner in which the principle is utilized in the Gaso Scope. The tube and funnel normally contain air above the level of the liquid, and this air is trapped when liquid is poured or splashed into the funnel, forcing the air down the tube. The air does not pass upward through the tube because of the surface tension of the liquid.

Diagram Explains Operation

Fig. 3 gives a more complete diagram of the principle of the Gaso Scope. The air pressure is always the weight of the liquid between the air level in the glass and the air level on the surface of the liquid. This pressure varies as the depth of the liquid varies. The funnel and tube keep the glass full of air. Excess air finds its way around the edge of the glass and escapes to the surface.

Fig. 4 shows this same principle as applied in the construction of the Gaso Scope. The gasoline splashes into



the funnel by the surging of the liquid in the tank. This carries globules of air down the tube into the air chamber. After the air chamber is full, the excess air flows out through the vent. The air under pressure moves the flexible diaphragm, thus indicating the amount of gasoline in the tank.

IT is reported from Bergen that a Norwegian engineer last winter made successful experiments with a device for converting an ordinary motorcycle for use over snow. The front wheel of the motorcycle is removed and by means of four long strips of springy steel which form a fork it is placed about a yard behind the back wheel. The tires are removed from both wheels and a flat balata belt fitted with narrow strips about $\frac{1}{2}$ in. thick is run over them. This belt is in constant contact with the snow surface. In place of the front wheel a light and narrow sledge is fitted in the steering head. During tests over a flat snow field a speed of over 50 m. p. h. is said to have been attained, and a 16 per cent gradient of smooth snow has been attained with ease.

How One British Laboratory Conducts Tests of Automotive Engines

Experimental work shows that unsatisfactory performance is due chiefly to poorly designed combustion chambers which give rise to detonation, incomplete burning of fuel and to excessive mechanical losses. Faulty distribution requires overrich mixtures.

By Harry R. Ricardo*

THE performances of engines differ very widely; examples which we have had to investigate have given maximum outputs ranging from 8 to 43 per litre of swept volume and fuel consumptions ranging from 0.45 to 0.85 pt. per b.h.p. at their most economical speed, while even engines of apparently similar design have shown what, at first sight, appear startling variations in performance.

The duty of any investigator must be to determine why such variations occur, and, in general, the major causes, at any rate, are not very far to seek.

The principal weaknesses in modern high-speed engines which militate against their performance are:

- (1) The form of the combustion chamber, which is frequently such as to give rise to harsh running, and even to detonation. This necessitates a very low compression, with consequent loss of power and efficiency.
- (2) The necessity for free movement of the gases within the combustion chamber, which is so essential to complete and efficient combustion, is only too often forgotten, with the result that there is left a considerable proportion of more or less stagnant gas which either does not burn completely or burns so late in the expansion stroke as to serve very little purpose beyond overheating the exhaust valves.
- (3) Mechanical losses are often quite needlessly high.

These three are at once the commonest and the most serious faults; collectively they may, and quite often do, prevent an engine from attaining more than two-thirds of the maximum torque and efficiency of another and apparently similar engine. Other causes are:

- (4) In the case of multi-cylinder engines, the distribution system may be such as to necessitate the use of an unduly rich mixture in order to give reasonable

uniformity of power as between different cylinders or quick responsiveness and acceleration.

- (5) The loss of heat to the cylinder walls, though this is a far smaller item than is usually supposed, and one which varies comparatively little as between different types of engines.
- (6) Lack of structural rigidity, giving rise to harsh running, vibration, and excessive local loading and consequent trouble with bearings.

In order to arrive at reliable evaluations of these several sources of loss we need, first, suitable apparatus for measuring them, and secondly, one or more really high-efficiency research engines for reference, as standards for comparison, on which the losses previously referred to have all been reduced to the absolute minimum, and also in which they have been evaluated accurately and quantitatively; and last, but not least, as much collective experience drawn from previous tests on engines of widely different design as possible.

Minimum Apparatus Described

With regard to apparatus, our own experience is that the following is about the minimum necessary to enable one to arrive at a just determination of the behavior of an engine:

- (1) A really sensitive dynamometer, preferably a swinging-field electric dynamometer, so that the engine can be driven and the friction losses, etc., determined accurately.
- (2) A quick and accurate fuel-measuring device, one which is uninfluenced by the viscosity of the fuel, and which can be relied upon to give accurate determinations of fuel consumption over a period of less than 60 sec.
- (3) Means for measuring accurately the air consumption, and therefore both the mixture strength and volumetric efficiency.
- (4) Means for recording the exact speed, or at least the exact number of revolutions during the consumption of a given amount of fuel.
- (5) Means for recording the amount of heat supplied to the charge before its entry to the cylinder.
- (6) A supply of gasoline of uniform grade, of which the calorific value and total internal energy per cu. in. of mixture and other characteristics have been accurately determined.
- (7) Means for controlling quickly the temperature of the circulating water.

With regard to the dynamometer, our own experience is that nothing can beat a good shunt-wound direct-current generator mounted on ball-bearing trunnions. The field should be separately excited through rheostats giving a very wide range of excitation. For absorption of the armature current, iron wire resistances placed in the open

*Condensed from a paper read before a Graduate Section of the (British) Institution of Automobile Engineers.

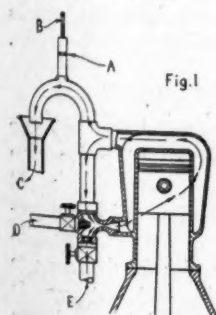


Fig. 1—Injector used instead of pump for circulating water

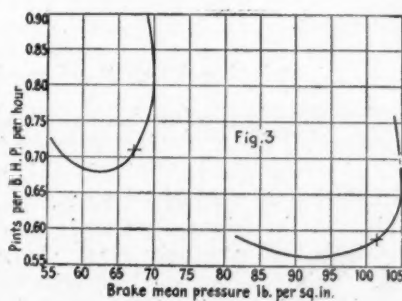


Fig. 3—Wide variation in relation between fuel consumption and b.m.e.p. in engines of same type, size and compression ratio

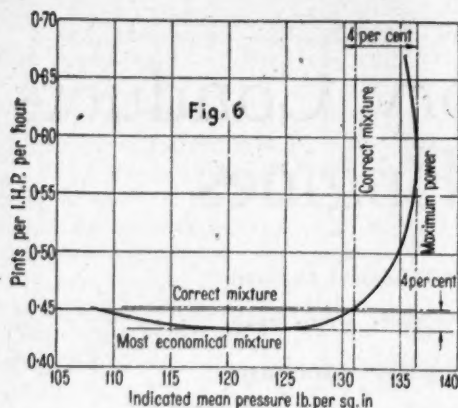


Fig. 6—Curves used in determining air consumption by plotting fuel consumption against i.m.e.p.

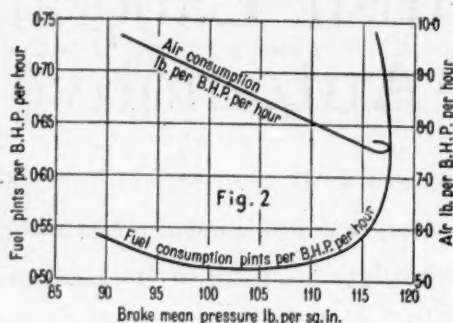


Fig. 2—Relation between fuel consumption and b.m.e.p.

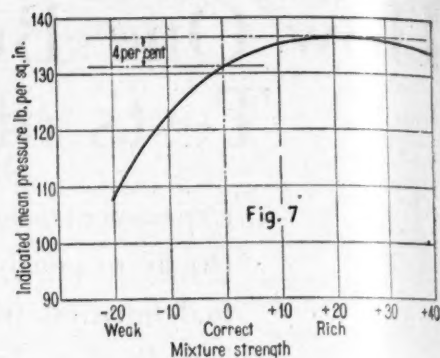


Fig. 7—Relation between i.m.e.p. and mixture strength

air have proved the most satisfactory. Frames 3 ft. by 2 ft. carrying about 12 lb. of galvanized iron wire wound in spirals will easily absorb 10 hp. each. Such a form of resistance has the great advantage that it reaches a constant temperature in less than a minute, and thereafter its resistance does not vary. We find that, provided the field excitation current is constant, and for this purpose we use a battery, the torque resistance does not vary appreciably after the first few seconds.

Such a dynamometer has the great advantage that it can be used also to determine the friction and other losses, and in this connection it has been found that if the armature circuit be changed over and the ignition and water circulation switched off suddenly, so that the engine is driven under temperature conditions almost identical with those under which it was running, the reading of torque obtained during the first minute or so invariably coincides very closely indeed with the true combined friction and pumping losses as determined by other and more elaborate means. That it does so is fortunate, for the conditions are not the same, the friction losses are lower and the pumping losses higher when driving, but happily these two discrepancies approximately balance each other for a time, though after the lapse of a few minutes the replenishment of the cylinder walls by fresh uncontaminated oil tends further to reduce the friction losses, so that readings, to be truly representative, must be taken as soon as possible after switching off the ignition.

Simple Device Preferred

For measurements of fuel consumption we prefer a simple device which consists merely of a pair of double conical vessels provided with a glass gage. The upper vessel holds exactly 1 pt. between the marks on the gage glass, and the lower vessel holds $\frac{1}{4}$ pt. The narrow necks insure that the fall of the fuel past the marks on the gage glass is very rapid, and it can therefore be clocked accurately, certainly to within 0.2 sec. Experience has shown that the most accurate results are obtained with readings of about 60 sec.; shorter readings accentuate errors in clocking; longer ones give too much opportunity for variations in speed or torque due to temperature and other variables.

For air consumption measurements we use a small balanced gas-holder, the fall of which is recorded automatically by means of a ratchet and counter, each tooth on the ratchet and counter corresponding to 0.2 cu. ft. A single switch throws both the counter on the air-measuring system and the revolution counter connected to the engine in or out of operation simultaneously, so that the exact amount of air per revolution of the engine can be

read off from the two counters. The great advantage of these forms of fuel and air measurements is that they can be calibrated so very easily and so very surely.

For recording speed we use a good tachometer belt-driven from the engine to give an approximate reading, but this is supplemented by a revolution counter which can be thrown in or out of operation by means of a magnetically operated dog clutch.

Early Investigations Inconsistent

Many of our earlier investigations proved hopelessly inconsistent because we did not take the precaution of recording the amount of heat put into the carburetor or induction system. The amount of preheating has a very powerful influence on the volumetric efficiency, and, to a lesser extent, upon the temperature of the cycle. We have found it essential to determine absolutely the extent of any preheating, and we disconnect any water or exhaust jacketing and substitute electrical heaters, so that the heat input can be controlled and measured.

The heat value even of any one standard grade of gasoline varies considerably from time to time, depending upon whether it is blended either naturally or artificially with naphthenes or aromatics, and this variation is sufficient to result in very appreciable variations in fuel consumption. By adding varying proportions of pure toluene to aromatic-free gasoline or by suitable blending of the two gasolines which we use the tendency of any engine to detonate as compared with the variable-compression or any other standard research engine can be determined, and a fairly accurate measure of the efficiency of the combustion chamber from the point of view of detonation can thus be arrived at, since mixtures of hydrocarbon fuels obey a straight line law as regards their tendency to detonate. In some few instances, notably in certain sleeve valve engines, the aromatic free gasoline will not detonate under any circumstances, and it then becomes necessary to add either in order to accentuate its tendency to detonate.

Injector Used for Circulating Water

For the circulating water we always use the injector shown in Fig. 1. This consists of a small high-pressure jet of water which, by its kinetic energy, sets up a rapid circulation in a closed circuit. An overflow pipe is provided at the highest point in the system and a supplementary water supply close alongside the high-pressure jet. This arrangement has the following advantages: It provides a brisk circulation, and therefore a fairly uniform temperature. The temperature of the circulating water can be controlled entirely by the amount of cold water admitted through the supplementary supply. The total quan-

tity of water in the system is only that required to fill the cylinder jackets and a little additional piping, hence its heat capacity is extremely small, and any desired temperature can be obtained within a few minutes of starting up, also the temperature can be varied rapidly and with great precision.

Our own practice on receiving any new engine for investigation is as follows:

The engine is first stripped completely and thoroughly examined, all clearances, etc., are checked and recorded, and any errors in workmanship or fitting are, if possible, made good. The valve-opening diagram is recorded. The water pump is removed and replaced by the circulator already described, also any heating to the carburetor or induction system is, if possible, removed and replaced by an electrical heater fitted to the air intake. The car-

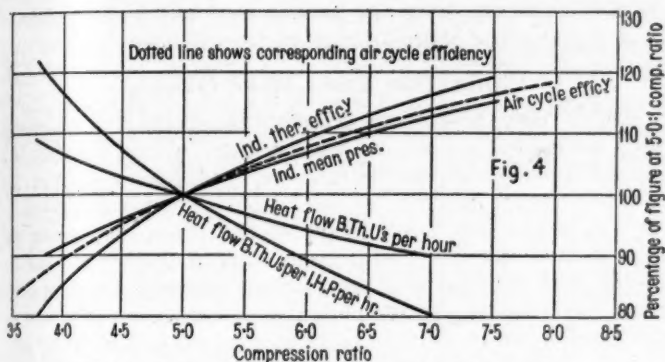


Fig. 4—Effect on performance of raising or lowering compression ratio

buretor is fitted with a choke tube giving a mean gas velocity of approximately $2\frac{1}{2}$ times that through the inlet valves of the engine, also a needle valve is fitted in the main jet so that the mixture strength can be controlled readily.

Engine Runs Under Light Load

The engine is first run under a comparatively light load for half an hour or so, after which it is driven in order to ascertain whether the friction is about normal. If the friction losses are higher than expected, or if the engine has not been previously run in, it is left to run for several hours at about half torque until the friction has reached a settled minimum. If all is well the engine is run under full load and a few observations made, such as determination of the best ignition timing and needle valve setting in the jet, also the influence of varying both the circulating water and air intake temperature is observed, the object at this stage being to gain some idea of the general characteristics and behavior of the engine.

The engine is then run with wide-open throttle, with the best ignition advance, and with a mixture strength giving maximum power at several different speeds until the peak of the power curve has been reached and passed, after which the ignition and water circulation are stopped and the engine driven at the same speeds and temperatures in order to determine the mechanical losses at the various speeds. The engine is then run up again to a speed of, say, 1000 r.p.m., with a very rich mixture and with wide-open throttle, when the following records are taken: The exact speed by counter, torque, temperature of circulating water in induction pipe, and of the air entering and leaving air bell, heat input to the carburetor in watts, the ignition timing in degrees, fuel consumption in terms of the seconds to consume 1 pt. or $\frac{1}{4}$ pt. and air consumption in cubic feet during the consumption of the unit volume of fuel.

The needle valve in the carburetor jet is then closed

very slightly and a similar set of readings recorded. This procedure is repeated progressively until the mixture becomes too weak, the speed surges and the engine tends to pop back. At each mixture strength the ignition is re-adjusted to give maximum torque. The tests are then repeated, working up from the weakest to the strongest mixture.

After the whole mixture range has been explored, the engine is again driven and the combined friction and pumping losses carefully recorded. The results of such a test are first plotted in b.m.e.p. against fuel and air consumption, as shown in Fig. 2. Fig. 3 shows the results of two such tests carried out on two somewhat similar commercial vehicle engines at a speed of 1200 r.p.m. It serves to illustrate the very wide differences which are to be found as between engines of similar type, cylinder capacity, compression ratio and generally outward appearance. The same procedure is then repeated at two or three other speeds, such as 1500, 2000 and 2500 r.p.m. Friction tests are, of course, taken either during or at the completion of each series.

Data Obtained from Tests

From the results of such a series of tests the following data can be gleaned: Maximum torque regardless of fuel consumption, torque at maximum fuel economy, mechanical efficiency, thermal efficiency at the most favorable mixture strength, volumetric efficiency, mixture strength both at maximum power and at maximum economy or at any intermediate range, thermal efficiency reckoned from the air consumption, loss due to irregularities in distribution, which latter can be arrived at by comparing the thermal efficiency as derived from the fuel consumption with that derived from the air consumption, and efficiency of the combustion chamber, which can be arrived at directly from the air consumption measurements.

The next step is to repeat the same series of tests, but at constant speed and varying throttle openings. Similar tests are then run at various speeds and loads to determine the heat flow to the circulating water, and in all such cases the complete mixture range is explored. Additional tests are then run in order to determine the tendency of the combustion chamber design upon detonation. This is arrived at by using aromatic-free gasoline and noting either how much toluene or other fuel must be added just to check detonation when the engine is running with a full power mixture and with an ignition advance giving maximum torque. In this manner it is possible to determine whether a higher or lower compression ratio can be used, and to what extent. From parallel tests on a variable compression research engine, the gain or loss in performance due to raising or lowering the compression can be determined, and is found to be as shown in Fig. 4.

Correction Curves Obtained

Such a series of tests is generally sufficient to enable nearly all the relevant factors to be determined, and, with the help of correction curves obtained from the special research engines, the effect of such variables as alterations of compression ratio, heat input, etc., can be predicted. For the fuels used we generally adopt as a standard heat input 4 watts per pound of air per hour. The effect of variation of heat input upon the volumetric efficiency, and therefore upon the power output, is as shown in Fig. 5, from which it will be seen how important it is at all times to know definitely the amount of heat applied to the carburetor or induction system.

Usually, when such tests have been completed, the needle valve is removed from the carburetor and fixed jets are fitted to give the nearest compromise; a further short set

of tests is then run at various speeds and loads in order to determine the efficiency of the carburetor as a metering device. Also the normal heating, whether water or exhaust, is replaced and another short test is made. By comparing the m.e.p. and the induction pipe temperature with that observed when the standard electrical heating was employed we are able, by the help of the curve referred to above, to decide whether the original method of heating is supplying too much or too little heat.

One of the greatest difficulties we have to face is that of attempting to evaluate the unknown proportion of oil burnt in the cylinder.

When the minimum fuel consumption per indicated hp.-hr. decreases as the load is reduced by throttling we have at once an indication that a considerable proportion of oil is being consumed, and, fortunately also, we have at least a rough check on the actual quantity burnt, for we know that the minimum fuel consumption per i.hp.hr. should be substantially the same at any load between 40 per cent and 100 per cent full torque. If, as not infrequently occurs, the fuel consumption at the most economical strength is lower at, say, 50 per cent, than at full-load torque, then the difference represents approximately half the quantity of oil burnt as fuel at full load, for the quantity of oil passing into the combustion chamber is dependent on speed alone and is independent of throttle opening.

Air Consumption Indications

Again, the air consumption gives us yet another clue, for this is unaffected by the nature of the hydrocarbon, whether it be gasoline or lubricating oil. We rely, however, on a comparison between the efficiency reckoned on the air and that on the fuel consumption from which to deduce the merits of the distribution system. A heavy oil consumption will render the efficiency reckoned on the fuel consumption fictitiously high, and so may give rise to an erroneous estimate as to the efficiency of distribution. In the majority of cases the oil consumption does not assume very serious proportions, but in a few instances it has proved sufficiently heavy to confuse the issue.

A very fair approximation, and in the case of single-cylinder engines a very close approximation, of the volumetric efficiency and air consumption can be obtained from an ordinary mixture range test without air measurement. From very accurate air consumption tests on the special research engines we find that, at the chemically correct mixture strength, the indicated mean pressure on gasoline is just 4 per cent, and on benzol 5 per cent, below the maximum obtainable, while the fuel consumption is about 4 per cent above the minimum.

If we plot fuel consumption against indicated mean pressure, as shown in Fig. 6, and draw a vertical line cutting the fuel consumption line 4 per cent below maximum mean effective pressure, this will give us the point at which the mixture is chemically correct; and since we know the weight of fuel consumed and the correct mixture ratio, we can arrive at the air consumption and, therefore, the volumetric efficiency, by multiplying these together. We can then check back from the known internal energy of the mixture, the observed thermal efficiency, and the volumetric efficiency so found, which should bring us back to the observed indicated mean pressure. If these agree, we may rest satisfied that we have arrived at a pretty accurate determination of the volumetric efficiency. Fig. 7 shows the observed relationship of indicated mean effective pressure and mixture strength plotted in another form.

Distribution Irregularities Eliminated

In the case of four-cylinder engines with Y-type induction pipes, irregularities of distribution can be almost

entirely eliminated by removing the tappets from cylinders No. 2 and 3, so that their valves remain permanently closed, and running on cylinders No. 1 and 4 only. By comparing the indicated performance obtained in this manner with that observed when all four cylinders are in operation we have another means of estimating the efficiency of the distributing system.

Careful air measurements on the special research engines have shown that the weight of air consumed per i.hp.hr. is virtually constant over a mixture ranging from 5 to 35 per cent excess of fuel. By setting the carburetor to give a rich mixture and measuring carefully the air consumption, we can thus arrive at the true efficiency of the engine without regard to errors of distribution or oil consumption. Again, the efficiency measured from both the fuel and the air consumption should, of course, be the same when the mixture is chemically correct; this gives us a valuable check on the accuracy of our measurements or a pretty clear indication as to the oil burnt as fuel.

Calibration Tests Made Quickly

Apart from the obvious economical aspect, it is in every way desirable that all calibration tests should be carried out as quickly as possible and every endeavor should be made to secure rapidity of operation. Though every care be taken, it is impossible to insure that the behavior of an engine does not vary with time, due to distortion, small mechanical changes and unavoidable changes in temperature, particularly the temperature of the lubricant. It is far more accurate to take tests of fuel consumption of one minute duration which can be clocked to within 0.2 sec., and, therefore, to an accuracy of 0.3 per cent than longer tests, for the influence of unavoidable variables exceeds the errors in clocking. For rapidity the two important considerations are handiness of the apparatus and thorough drilling of the test gang. Given the necessary experience in drilling, a test gang consisting of one observer and three assistants can carry out a test extending over the whole mixture range, both up and down, together with air

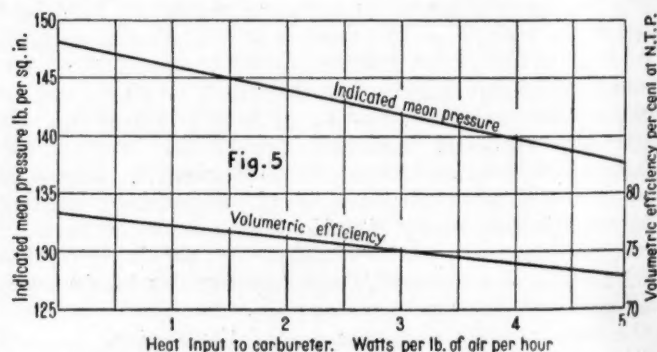


Fig. 5—Effect of heat input to carburetor on volumetric efficiency

measurements and a heat balance test, in a little over one hour, including also friction tests.

From the tests enumerated above it is possible to analyze the performance of any engine as regards most of the relevant factors and to evaluate, quantitatively, its various defects.

It may be objected that no mention has been made of any purely mechanical tests, but the calibration tests described will occupy from first to last some 25 hours running, the bulk of it under extremely arduous conditions. An engine which will come through such a gruelling without its power or efficiency varying more than 1 per cent, which is about the limit we can allow, may be considered to have proved its mechanical fitness pretty thoroughly. Comparatively few engines survive such an ordeal without

one or more mechanical overhauls during the period.

On the whole, our observations have been that engines of high efficiency (always provided their compression is reasonable and there is no detonation) tend to maintain their performance and give far less trouble on test than low efficiency engines, for the obvious reason that they convert more of the heat supplied to them into useful work instead of letting it flow into the cylinder walls, pistons, exhaust valves, etc. In our experience the bulk of all mechanical troubles is due directly or indirectly to excessive heat flow. We encounter far more trouble from gummed-up piston rings, carbonization, pitted or burnt out exhaust valves and bearing failures with low efficiency engines than with high efficiency engines.

On looking over our files of test records, the writer finds that in nearly every case the engines which have given least trouble on the test bench are those which also gave the lowest fuel consumption. He is inclined to the belief that the real reason why high efficiency engines have

gained the reputation of being, as a whole, less reliable and less able to maintain their tune is to be accounted for by the fact that their designers, thoroughly sound on the theoretical side, are by no means so well versed in mechanical design; certainly the mechanical features of some of the high efficiency engines we have tested have been lamentably defective. Lack of rigidity, defective cooling, ill disposed bearing surfaces, ill arranged and often excessive lubrication, etc., are among their worst vices. On the other hand, the best mechanical designers appear to pay little attention to the theoretical side of the question, with the result that they do not get the power output or economy from their engines which they might well have done, and that without any prejudice to their reliability. It must be noted also that there is a decided tendency to dub any engine which is organically defective as being a "high efficiency" engine when more often than not it has no claim whatever to such a distinction and is merely a bad engine.

Water-Resistant Cold Press Blood Albumin Glue

A FORMULA and method of preparation for a highly water-resistant cold press blood albumin glue, developed at the Forest Products Laboratory, is given below. This glue does not require hot pressing, as do the older types of blood albumin glues, but is used in a cold press in the same manner as casein or vegetable glues. It can, however, be used in a hot press if the occasion demands. The improved glue can be used with success in the production of plywood and for gluing lumber of the species having low shearing strength, but in the stage of development which has produced the formula and preparation described here, it cannot be recommended for gluing thick veneer or lumber of heavy dense species. Further development may make the glue strong enough for use with all species. The glue shows a moisture resistance far superior to that of any glue in ordinary use at the time of its discovery.

The formula is as follows:

- 100 parts by weight of soluble blood albumin.
- 140 to 200 parts by weight of water (according to glue consistency desired).
- 5½ parts by weight of ammonium hydroxide (Sp. gr. 0.90).
- 15 parts by weight of trioxymethylene (paraformaldehyde).

Albumin Covered with Water

The blood albumin is covered with water and the mixture is allowed to stand for an hour or two. When it is stirred at the end of this period, the blood albumin will for the most part go into solution. The ammonium hydroxide is added with more stirring. Then the trioxymethylene is sifted in, and the mixture stirred constantly at a fairly high speed. The trioxymethylene should not be poured in so rapidly as to form lumps nor so slowly that the mixture will thicken before the required amount has been added. Regardless of the manner in which the trioxymethylene is added the mixture will thicken considerably at this point. This thickened mass will become fluid again in a short time at ordinary room temperature and arrive at a good working consistency in about an hour, remaining in this condition for at least six or eight hours. When this glue finally hardens it cannot be dissolved again in water.

The glue may be applied by means of a brush or mechanical spreader.

Several precautions should be observed in mixing and applying this type of blood albumin glue:

1. Weigh out all constituents. Do not use volumetric measure.
2. Add water at room temperature and do not heat the mixture.
3. Do not stir the blood until it has soaked for from 1 to 2 hours.
4. Avoid excessive stirring of the glue or agitation of the spreader, as this causes foamy glue.
5. Use sufficient pressure to insure good contact, but not enough to crush the wood.

The fact that cold press blood albumin glue will solidify under water indicates that the "setting" of this glue is a chemical reaction and not a result of evaporation. (*Technical Note No. 202, Forest Products Laboratory.*)

New Road Lighting System

A ROAD lighting system worked out by engineers of the General Electric Co. will be installed on the ideal section of the Lincoln Highway, located 35 miles south of Chicago, in Lake County, Ind. The lighting unit comprises a new system of reflectors which is intended to throw the maximum possible amount of the light where it is wanted, that is, on the highway, instead of scattering it over the adjacent fields. A nest of reflectors is provided, a series of three, one within the other. There are two sets of these reflectors, mounted end to end, so that light from one source is thrown along the highway in both directions. Windows in the outer reflectors provide for the illumination of that part of the road close to the lamp post. It is claimed that with a 250 candle power bulb an apparent candle power of 3700 is obtained with this unit. The bracket holding the lamp and the reflector is fixed to an ornamental concrete pole 35 ft. long and is adjustable both horizontally and vertically, permitting the best illumination on curves and grades. One of these lamp posts will be installed every 250 ft. along the edge of the 40 ft. concrete pavement of the Ideal Section. Alternate posts will be on opposite sides of the road, and all wires will be carried underground. The lamps will be controlled by an automatic oil time switch, which can be adjusted to turn them on and off at any desired hour of the day.

Used Car Becomes Real Sales Problem in Scandinavia

Good market for American vehicles exists, says H. G. Zimmerman, General Motors Export Corp. branch manager at Copenhagen. An effort is being made to standardize retail prices within each country. High grade representation is greatest selling need.

USED cars recently have become an important problem in the Scandinavian market, according to H. G. Zimmerman, manager of the Copenhagen branch of General Motors Export Corporation, who returned to Sweden last week after a four weeks' stay in the United States. Trading in old cars as part payment for new ones has been customary in Scandinavia as in the United States, but only within the last year or so has the practice begun to develop real merchandising difficulties.

This was one of the interesting statements made by Zimmerman while discussing the Scandinavian situation in an interview given to AUTOMOTIVE INDUSTRIES shortly before sailing. His views on the present condition of the market may be summarized as follows:

PROPER used car buying is one of the more recent problems involved in merchandising American vehicles in Norway, Sweden and Denmark. Many owners are coming to our dealers with old, broken-down European cars which are worth little or nothing. If the owners aren't offered a good trade-in value they walk out and visit six or seven other dealers. Then they are likely to buy from the dealer who gives them the largest allowance. In this respect, the situation is very much the same as at home.

Two other factors complicate the Scandinavian situation, however, and make it a bit more complex than in the United States. First, deflation of values has been much greater in Scandinavia since 1920 than it has been over here. A new car which once sold for 9000 kronen now sells for about 6000 kronen. When the man who bought at 9,000 kronen asks for a trade-in value, the dealer quotes on the basis of a 6,000 kronen car. Naturally, the owner thinks he is getting a bad deal.

SECONDLY, in some instances, high retail prices have been established so that the dealer can make large trade-in allowances and give a large discount for cash. This situation often leads the dealer to make excessive allowances on used cars and then raise the price of his new cars in an attempt to take care of the loss.

Despite these added complications, the situation is being met in a constructive way by many manufacturer's representatives and distributors. Strenuous educational efforts in connection with proper appraisal and reconditioning of cars is having its effect and can be counted on to help materially over a period of years.

Of more immediate value in correcting over-valuation evils is the attempt of a few strong American companies to force some degree of retail price standardization on new cars within the confines of each country. This is

being accomplished primarily through selling distributors on the American idea of "greater ultimate profits through quantity sales at low price."

PROPAGATION of this idea will undoubtedly benefit both manufacturers and Scandinavian dealers in the long run, as many foreign agents already have discovered. Where it is possible to get a distributor really to try out the small-profit-per-unit idea, his own experience usually makes him a hearty advocate of the plan in a year or so.

Only a few companies are in a position to take a very strong stand with Scandinavian distributors on this point, but their efforts have already begun to bear fruit. All manufacturers benefit from the successful efforts of a few along this line, because dealers for every make finally have to cut their retail prices to meet the competition of the strong lines which lead the way. The result will be an increased sale of American automotive products throughout Scandinavia. Considerable progress has already been made, and retail prices in Norway, Sweden and Denmark are very nearly what they ought to be now, all the factors involved being considered.

GETTING good representation is the most vital problem for American exporters. The American lines which are really selling cars in any quantity to Scandinavia easily can be counted on the fingers of two hands. The relative sales volume of these companies is directly proportional to the size and character of the distributing organization which they have built up.

In a few districts the peculiar suitability of a car to specific operating requirements affects sales to some extent, but the real determining factor is the ability of the Scandinavian distributors and dealers. This fact is borne out by a statement made recently by a member of the General Motors Export Corp. research staff. This executive pointed out that records show sales to have been almost exactly proportionate to the number of direct contacts with car buyers in every country. Three dealers operating in different parts of a territory, for example, bring in far more business than one big dealer traveling three men from a central point.

*To get the proper kind of distributors requires a thorough knowledge of local problems and constant contact with the territory. Only a few American manufacturers in the past have kept in constantly close touch with the market through factory representatives, but the trend is in this direction.

Service is becoming more important as a sales asset every year in the Scandinavian territory. Good facili-

ties already exist nearly everywhere and practically all distributors are thoroughly sold on the need for providing quick and thorough maintenance work. Every General Motors dealer carries a stock of parts sufficient to meet any ordinary needs. He can procure special parts and service from the main distributor within 24 hours at any time. This is not necessary very often, however, as distributors are giving special attention to keeping dealers well stocked with a steady flow of needed replacement parts.

It is in providing rapid service that the large organization has the greatest advantage over its smaller competitor in foreign markets. A considerable volume of business is necessary in any given country to make possible a wide distribution of replacement parts. On the other hand, such wide distribution is necessary if sales are to be made from now on, as owners have come to rely on their cars as means of transportation day in and day out; they resent having to wait several days for a repair to be made or for a minor part to be replaced from some distant point.

Certain cars which now have a very wide sale in Scandinavia were not selling at all well a few years ago because they were being distributed more rapidly than

service facilities were being expanded to take care of them. As the maintenance situation was remedied, sales on these lines picked up materially and now are very high.

PROSPECTS for future automotive sales in Scandinavia are extremely bright. Ninety per cent of the cars being sold there today are American-built products. There is every indication that this percentage will be maintained or increased. Road conditions are fairly good, but rugged, powerful cars are needed to do the work required of them in Norway and Sweden. For this reason American cars are far more popular than the less powerful European makes. Tax regulations do not affect American cars unfavorably, except in Denmark, where a horsepower tax operates to the disadvantage of vehicles of large bore and stroke. Sales in Denmark are good, however, despite that disadvantage.

Trucks can be sold in Scandinavia, although the market is not nearly so active as that for passenger cars.

Taken as a whole, there are few better markets than Scandinavia for American automotive products, and the constructive way in which the territory is now being cultivated indicates a full realization of that fact on the part of American manufacturers.

Illumination and Selling Are Topics Discussed in New Books

WITH our increasing industrial activity the science of illumination has taken on increased importance. Less than a hundred years ago the only artificial illuminant in use was the candle, and the progress which has been achieved in inside and outside illumination during the past century has been phenomenal. First, of course, came illumination by coal gas, the advent of which dates back almost a hundred years; then came the kerosene lamp, and finally the various forms of electric lighting, by arc lamp, incandescent lamp and mercury vapor tube. A whole science has developed around the means of artificial illumination and since 1906, when the Illuminating Engineering Society was organized in this country, this field of endeavor has been regarded as a separate branch of engineering.

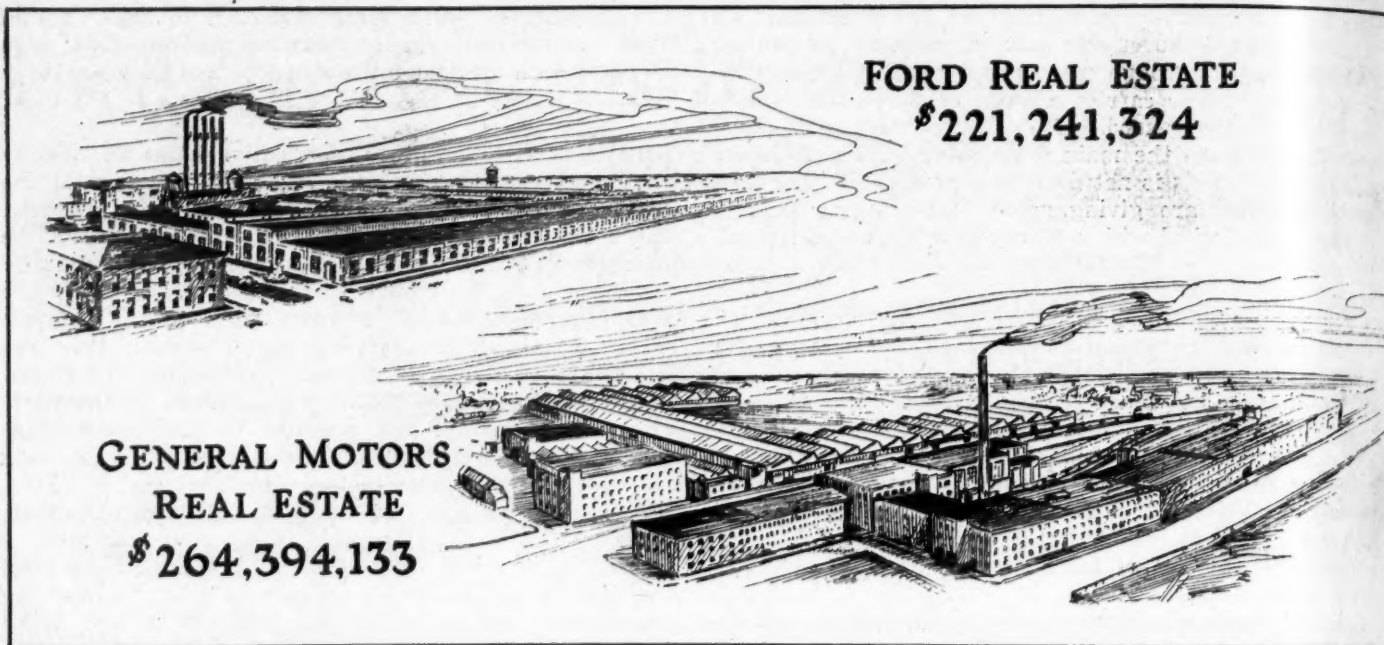
France claims to have done a certain amount of pioneering in this line, some of the units now used in photometric measurements having been suggested by Andre Blondel, but it is admitted—in a book by E. Darmonis entitled *L'Eclairage, Solutions Modernes des Problemes d'Eclairage Industriel*, just published by Gauthier-Villars et Cie of Paris—that she has dropped behind in the matter of late, the most intensive development in the lighting field having taken place in England and the United States. France, however, recognizes the economic importance of good illumination, and increased interest is being shown at present. The book under review deals with the subject under four general headings, as follows: 1.—An outline of the principles of radiation, units and photometric measurements; 2.—Descriptions of lighting apparatus (electric and gas only), their present state of development, with brief references to the most recent improvements; 3.—An outline of the properties of the human eye; 4.—The science of illumination and its application to practical problems in inside lighting (halls, offices, factory buildings) and outside lighting (docks, quays, streets). The

book seems to be intended chiefly for architects and engineers who may be called upon to draw up specifications for the installation of lighting equipment in industrial establishments, etc., and it would seem to meet the needs of these classes. That phase of the lighting problem with which automobile engineers are most directly concerned, viz., vehicle lighting, is not referred to.

CHARLES HENRY MACINTOSH, a former International President of the Associated Advertising Clubs of the World, has added another volume to the already huge library of sales literature. His contribution, recently published by D. Appleton & Co., is called "Creative Selling."

Having proved the rather obvious fact that everybody has something to sell, whether it be merchandise or ideas, the author says in forty-seven pages that effective thinking is essential to effective talking and that one must have an idea clearly in his own mind before he can make it clear to someone else. He then presents the reader with seven keys to successful selling. The keys are: Knowledge of the subject, knowledge of the object, knowledge of the prospect, make it easy to pay attention, make it easy to understand, make it easy to believe, make it easy to act. These subjects are discussed in thirty pages. Treatment of the topics of "mass selling" and "keeping customers" fills the remaining sixty pages of the book.

A multitude of simple examples appear on every page, doubtless for the purpose of clearly illustrating the various points made. While the example method has very definite advantages, it is possible to carry it so far as to bore the reader of even average intelligence. Few of the ideas developed in the book are complex enough to need much illustration of any kind so far as the business executive reader is concerned.



Ford and General Motors Assets Half Those of U. S. Steel Corp.

Combined They Exceed \$1,612,000,000, While Difference in the Two Big Automotive Units Is \$33,000,000.
Value of Real Estate Is About Equal.

THE Ford Motor Co. and the General Motors Corp., the two outstanding factors in the motor vehicle field, had joint assets on June 30 last of \$1,161,612,412. This was approximately half the assets of the great combination of companies included in the United States Steel Corp., the greatest single industrial combination in America.

From these facts a definite conception can be gained of the magnitude attained by the automotive industry which came into being about the time the Steel Corp. was incorporated in 1901.

Strangely enough, there was a difference of only \$33,000,000 in the Ford and General Motors assets on June 30. Those of Ford aggregated \$597,339,236 and of General Motors \$564,273,176.

These two companies made in 1922 a trifle more than 63 per cent of all the cars and trucks produced in the United States. In point of units, Ford had 46 per cent with 1,231,000, and General Motors had 17 per cent with 456,763 out of a total of 2,659,000, leaving 971,000 for all the rest of the companies in the field. The average selling price of the General Motors products with a full line of cars, obviously was much higher than that of Ford with only one. The percentages of output for 1923 probably will be approximately the same notwithstanding the much larger total production.

Comparison of the Ford and General Motors balance

sheets is interesting although they are not identical. Ford had on hand \$230,811,918, or more than four times the \$56,055,248 in the hands of General Motors. For some reason, probably so no one would know exactly how much he had, he included good-will and trade-marks in this account, while General Motors carried this item separately with a value of \$22,440,811. It is not likely, however, that Ford placed an excessive value on these intangible items. He listed them in 1922 at \$20,517,986.

While General Motors is in an exceedingly strong cash position, that of Ford is astounding. His holdings are by far the largest ever shown by any industrial company in the world. Assuming that the figure was around \$210,000,000 on June 30, there are very few companies with a larger annual gross turnover.

There was a somewhat striking similarity in the value of the real estate, plants and equipment of the two corporations, that of General Motors being held at \$264,394,133 and Ford's at \$221,241,324. Both have far-flung interests.

In respect to inventories there was little difference, General Motors amounting to \$114,725,627 and Ford's to \$107,609,419. General Motors figured its inventory at cost or market, whichever was lower, and presumably Ford did the same.

Ford listed neither accounts nor notes receivable in his table of assets, while General Motors had \$18,130,000 in accounts receivable and trade acceptances with \$5,232,226

GENERAL
MOTORS
CASH

\$56,055,248



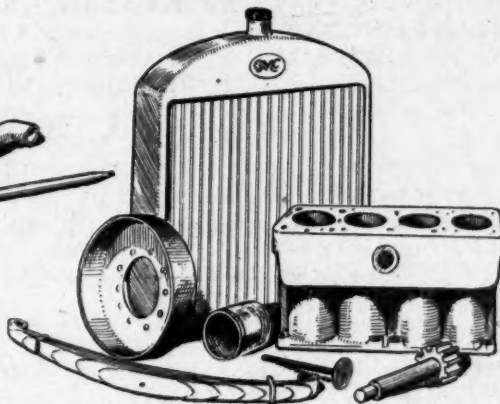
FORD CASH \$230,811,918



FORD
INVENTORY
\$107,609,419

GENERAL MOTORS INVENTORY

\$114,725,627



in notes receivable. On the same date in 1922 Ford had \$47,255,625 in accounts receivable.

Both companies had remarkably small current liabilities in relation to assets, those of Ford amounting to \$52,-472,217 in accounts payable and of General Motors to \$30,657,255. Neither had any notes payable. All these bills evidently were for current supplies of materials. Ford listed \$62,015,847 as a reserve for depreciation and General Motors \$57,224,155. Ford has a tax reserve of \$33,245,329, while General Motors had a tax reserve of \$5,483,000 under the heading of "reserves" and an item of \$22,623,448 under current liabilities for taxes, pay-rolls and sundries accrued but not due.

Ford's position in respect to surplus is much better than General Motors. He has \$414,129,158 while General Motors has \$116,198,598 "over and above \$10 per share of no par value common stock."

The main difference between the Ford company and General Motors, of course, is that the Ford family owns all the \$17,264,500 of the Ford capital stock while the \$315,629,970 in all classes of General Motors stock is held by thousands. In arriving at this figure, the 20,646,327 shares of common are valued at \$10 a share, while the present quotation is around \$15.

The disparity in the outstanding stock of the two companies explains much of the difference in the volume of surplus. General Motors has paid dividends regularly on its preferred and with a considerable degree of regularity on its common, while there has been no incentive for the distribution of Ford surplus in the form of dividends because the stock is all held in the family. General Motors

also wrote off exceedingly heavy inventory losses after the slump in 1920.

Ford stock is not on the market and is not for sale, but if it were the quotations would run well into four figures. The company, which now has assets of more than half a billion dollars, was incorporated in Michigan only 20 years ago with assets of less than \$100,000. Henry Ford's original investment was \$28,000, a considerable part of which was subscribed by friends, notably the Dodge brothers and Senator James Couzens of Detroit, whose investment was the basis of huge fortunes.

The only other companies engaged exclusively in the manufacture of motor vehicles with assets exceeding \$100,000,000 are the Studebaker Corp. and the Willys-Overland Co. Dodge Brothers ranks fifth with more than \$75,000,000 and Packard sixth with approximately \$60,000,000. The cash position of Dodge Brothers, with more than \$20,000,000 on hand, is extraordinarily strong. Practically all the stock of this company is owned by the families of John and Horace Dodge.

Seven or eight other companies in the truck and passenger car fields have assets in excess of \$20,000,000, and the grand total of the entire manufacturing end of the industry, including Ford and General Motors, probably approximates \$2,500,000,000.

This accumulation of wealth in two decades never has been approached in industrial history. It demonstrates beyond cavil the fact that the motor vehicle has gained its tremendous hold upon the imagination of the American people because of its utility as a means of individual transportation.

FOLLOWING is a comparison of apparently identical items in the Ford and General Motors balance sheets:

Assets	Ford	General Motors	Liabilities	Ford	General Motors
Cash	\$230,811,918	\$56,055,248	Accounts Payable....	\$52,472,217	\$30,657,255
Inventory	107,609,419	114,725,627	Depreciation Reserve..	62,015,847	57,224,155
Real Estate, etc.....	221,241,324	264,394,133	Tax Reserves.....	33,245,329	28,106,448
			Surplus	414,129,158	116,198,598
			Capital Stock.....	17,264,500	315,629,970

Substitute Automotive Fuels Obtained From Lignite and Peat

Low temperature distillation system applicable to these as well as to coal. Both are used extensively abroad. Lubricating oils also obtained, but quality has been unsatisfactory. Many experiments made in Germany and other countries in Europe.

By P. M. Heldt

THE low temperature system of distillation described in a recent issue of AUTOMOTIVE INDUSTRIES can be applied also to lignite and peat. Of these two fuels the United States has enormous resources, which, however, are not being worked at the present time because these fuels cannot compete with coal. Abroad both lignite and peat are used extensively. Lignite is mined like coal but is found at lower depths, while peat is found right at the surface of the earth in so-called peat bogs, having been formed by the decomposition of the vegetable material that grows in such bogs. The composition of each of these two fuels varies widely and their behavior on distillation can be given only in general terms.

The liberation either of gas or of hydro-carbon vapors from lignite begins at between 480 and 660 deg. Fahr. Sometimes the liberation of vapors is practically completed at 850 deg., while sometimes it continues until a temperature of 1200 deg. has been reached. Combustible gas often appears below 575 deg. At these temperatures the gas is of very poor quality, containing much CO₂ and sometimes H₂S. Toward 930 deg. a gas very rich in methane (marsh gas) is obtained, with a lower heat value of 620 B.t.u. per cubic foot. The heat value then diminishes, the hydrogen content increasing while that of marsh gas decreases. If the distillation is carried to 1375 deg. a gas is obtained the lower heat value of which varies between 450 and 500 B.t.u. per cu. ft.

Table of Yields

Following are the yields in different light oil fractions from seven samples of lignite, in gallons per ton of dry lignite without ashes:

Fractions	1	2	3	4	5	6	7
Up to 332 deg. Fahr.	4.04	1.80	1.80	0.50	1.32	1.20	0.5
332-465 deg.....	5.05	6.72	....	6.00	6.60	4.68	2.04
465-575 deg.....	5.05	5.41	9.14	8.90	7.94	4.20	2.88
575-680 deg.....	8.70	3.62	9.62	....	....	2.40	....
Total unrefined oil.	22.84	17.55	20.56	15.40	15.86	12.48	5.42

Of the above fractions only the first two could be considered as automobile fuel. Thus from 2.5 to 9 gal. of motor fuel is obtained per ton net of lignite, and one may figure with a maximum yield of 4.8 gal. per gross ton net. The intermediary and heavy fractions are excellent Diesel and semi-Diesel engine fuels and need not be dephenolized for the purpose. Their fluidity, which is due to the low temperature of carbonization, renders them particularly suitable for this purpose. There is thus obtained from 10 to 15 gal. of fuel oil substitute per ton net and about 10.8 gal. per gross ton.

The Germans during the war distilled large quantities of lignites for their lubricating oils, keeping below 1100 deg. Fahr. This gave color to the idea that large proportions of lubricating oil could be obtained from lignite. As a matter of fact, Germany during the war was compelled to have recourse to inferior lubricants, using even the phenols, notwithstanding the fact that these corrode the metals and thicken on exposure to the atmosphere.

Satisfactory Lubricant

The oils which pass over beyond 500 deg., after dephenolization and treatment with concentrated sulphuric acid, constitute a more or less satisfactory lubricant. Aside from the fact that they often contain considerable quantities of sulphur compounds, their chief deficiency lies in lack of viscosity. It is possible to obtain from 2.5 to 6.25 gal. of dephenolized lubricating oil distilling over above 500 deg. per ton net, and in the most favorable case 5 gal. per ton gross.

No extensive data of the results of low temperature distillation of peat are available, but the carbonization of peat for the purpose of obtaining peat coke or peat carbon has been practiced for a long time. Carbonization in the Ziegler vertical retort closely approaches low temperature distillation, the action being quite gradual. The operation of this oven was studied some ten years ago by an agency of the Prussian Government and the results were published. It should, perhaps, be pointed out that, since some cracking undoubtedly took place, the yield in light oils is not the maximum which might be obtained if that were the chief object in view. From a metric ton of peat (2204 lb.) there were obtained 600 lb. of peat coke, 100 lb. of tar, 1000 lb. of wash liquor and 13,000 cu. ft. gas. The tar was distilled and yielded 45 per cent of light oil, 15 per cent of heavy oil, 7 per cent of paraffin, 30 per cent phenols and 3 per cent pitch. The wash liquor yielded 6.6 lb. methyl alcohol, 1.65 lb. ammonia, 6.6 lb. sulphur compounds and 9.5 lb. of acetic acid.

Peat Is Poor Fuel

Peat is a comparatively poor fuel and cannot be economically transported any considerable distance. One way of turning it to useful account would be to distill it where it is produced, use the resulting coke in generating electricity and incidentally recovering the tar. Another possibility consists in coking the peat on the spot, producing a coke comparatively free of ash and sufficiently hard to withstand transportation, and recovering as by-products tar, acetic acid, alcohol and sulphur compounds. Inasmuch as the peat does not con-

tain enough heat units to drive off all of the water present in it in the original state, it is necessary to sundry it in order to make it of economic value, and as this can be done only in summer, plans of the type suggested would have to figure with more or less irregular operation. There is, however, a by-products coking plant operating on peat in Oldenburg, Germany, and similar installations of considerable size are said to exist in Ireland.

Tar Oil Marketed

German coal tar distillers for some time have been at the point of marketing the light fractions of low temperature tar oil as a motor fuel, but have been hesitating on account of the rather unpleasant odor of the product. Reports of successful experiments with this fuel in automobile engines have been received here recently. The tests were made with a product having a flash point of 512 deg. Fahr. It is stated in the report that in order to use the fuel successfully it must be preheated by the exhaust gases, and it is then sprayed into a carbureter mixing chamber which is heated with hot water. In order to keep the water circulating through the heating jacket at the highest possible temperature, the circulation is controlled, with the result that a mixture of steam and water is formed in the cylinder jackets.

The engine is started on benzol but after a few minutes operation a sufficiently high temperature has been reached to permit of switching over to the coal tar light distillate. Three 5-ton motor trucks have been run on this fuel in Wiesbaden ever since March, 1922. To obviate trouble from failure of the ignition or incomplete combustion, it has been found expedient to fit a small benzol carbureter which can be kept in action all the time if desired.

Several different carbureters were tested out with a view to reducing the consumption to a minimum. After 1250 miles operation the engines were taken down and the cylinders examined. No injurious deposits were found, it is stated, and the lubrication of the engine seemed to be unaffected. The use of this fuel in Germany is said to result in appreciable economy. The three trucks used in the tests consumed on an average 10 gal. of benzol and 32 gal. of coal tar distillate per 100 miles, as compared with from 27 to 35 gal. of benzol alone. The saving on fuel is from 50 to 70 per cent as compared with the use of benzol alone.

Residue Procured

Besides the phenol oil from crude tar the utilization of which for other purposes in the past has caused considerable difficulty, a residue oil was used having a distillation range of from 250 to 575 deg. Fahr. This oil remains after washing off the benzol from the illuminating gas.

Low temperature distillation is a comparatively new development and still in the experimental state. It can be worked economically only on a large scale, and as coke and gas manufacturers naturally hesitate to lay down expensive plant without being sure of results, commercial development has been rather slow.

The problem of a substitute for gasoline has been to the fore in Europe for a good many years, partly because the trade balance of the countries using automobiles to a considerable extent is very adversely affected by the heavy imports of motor fuels required by them, and partly because automotive machinery of one kind and another is now playing an exceedingly important part in war, so any country which might be cut off from its sources of motor fuel would be at a great disadvantage

in case of war. In Germany the situation has been rendered worse by the heavy depreciation of the mark in the exchange markets, which has made it necessary to use domestic raw materials if at all possible.

Two possible substitutes for gasoline when it becomes scarce and inordinately expensive are now in sight, viz. alcohol and light hydro-carbon oil derived from coal. Of the two, the latter seems to have by far the best chance in countries having extensive coal deposits, for, as has been pointed out in reports of various fuel commissions, the collection of waste products from which to make the alcohol involve too much expense, and in the countries where most of the motor fuel is needed no acreage is available for the raising of grain, beet or potato crops for the manufacture of alcohol. It is thus practically certain that coal tar light oil will be the immediate successor of petroleum light distillate or gasoline.

Protective Coatings for Iron and Steel

ACCORDING to the du Pont Magazine finishing coats of paint on metal surfaces cannot give the best results unless the paint that lies next to the metal is correct from the standpoint of rust prevention or "inhibition," as it is called. This priming coat should be of such a character that it will be: chemically permanent, chemically inert toward iron, sufficiently elastic to expand and contract without damage and rust-inhibitive.

Chemical permanence refers to the necessity of a perfect affinity between the pigment matter and the vehicle and the pigment must be exceedingly fine for most satisfactory results. When such a paint is used, it does not break, but makes a continuous film. If the attraction of the pigment for the oil does not exist, the paint may brush out thin, the film may be full of breaks and imperfections invisible to the eye, and the result is poor protection to the metal underneath.

Chemical inertness toward iron is necessary for the reason that there are certain pigments that stimulate corrosion: and such paints should never be applied next to the bare metal. On the other hand, there are certain pigments that possess a high degree of inertness toward iron and steel and are rust-inhibitive to a superlative degree.

Elasticity is one of the most important characteristics of a successful priming coat. If, when dry, a primer does not possess sufficient elasticity to expand and contract along with the metal over which it is used, it will not only fail as a primer, but will seriously affect the protective qualities of the finishing coat or coats that are applied over it. As a consequence, therefore, such finishing coats will likely crack and eventually peel from the surface. Such action is traceable directly to the lack of elasticity in the priming coat.

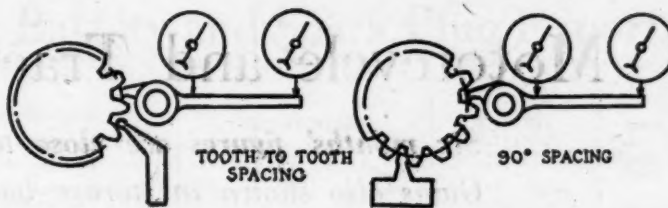
Rust-inhibition Important

Rust-inhibition is the most important consideration of all in the choice of a priming paint. Given a primer that successfully meets all other qualifications, yet is so composed that the pigment portion fails to resist, but rather stimulates the production of rust—such a priming coat is worse than useless. Extensive tests carried on by the American Society for Testing Materials over a period of years has proved beyond doubt that the best pigment from the standpoint of rust-inhibition is basic lead chromate. This pigment—commonly known as American vermilion—has shown the longest life and best protective qualities of any of the large class of pigments that have undergone the series of tests referred to.

and the tooth flank at the base circle. The cross slide is then moved across the instrument by means of the hand wheel and screw, and if that portion of the tooth flank above the base circle is a perfect involute the dial gage pointer will remain at zero. This can be plotted on a chart in the form of a straight horizontal line, the abscissas representing motion of the slide and the ordinates errors of profile. A plunger automatically retards the hand-wheel at the end of every 0.010 in. of motion. If the profile is not a perfect involute it is usually either a single concave or convex curve, as indicated in Fig. 3.

For checking the tooth-to-tooth spacing of spur gears the tester is used as indicated in Fig. 4, and 90 deg. spacings are checked as indicated in Fig. 5. Where it is not possible to reverse the gear the indicating lever may be reversed.

It is sometimes desirable to maintain a master curve



Figs. 4 and 5—Methods of using the gear tester for checking tooth-to-tooth spacing and 90 deg. spacing

or duplicate an established form. This may be done by using the longitudinal slides, first plotting the master and then checking the other gears with the chart. By making special adapters, helical gears may be checked for profile and spacing, and bevel gears are handled in a similar manner.

New Company Makes Rubber Spring Supports

RUBBER spring supports designed to replace the usual steel shackle and in addition serve to absorb shock have been developed and placed on the market by the Rubber Shock Insulator Co., Inc.

The shackle consists of a cast steel housing inclosing an irregular block of rubber. The spring end, to which a bearing plate is riveted, is imbedded in a slotted opening in the rubber block. The shackle is then assembled under compression and becomes a part of the spring bracket. The spring is held firmly in the rubber block, completely insulating it from contact with other metal. The only "play" in the assembly is that permitted by the resiliency of the rubber block.

The irregular shaped rubber block does not fill the entire cavity of the steel housing and the relation of the height of cavity to the rubber block varies according to the load carried and whether used on front or rear springs. Both the upper and lower columns of rubber must be in contact

with the spring, and because of the initial compression the spring is held in suspension at all times.

The pressure required to assemble the insulator giving the correct compression is called the assembling pressure, and this varies with the load. In every case the initial design of housing and block is based on the particular vehicle upon which the insulator is to be used.

This insulator is claimed to absorb road shocks and other vibrations and indirectly to lengthen the life of both vehicle and tires. Its use reduces the number of places requiring lubrication and is claimed to cut the cost of upkeep.

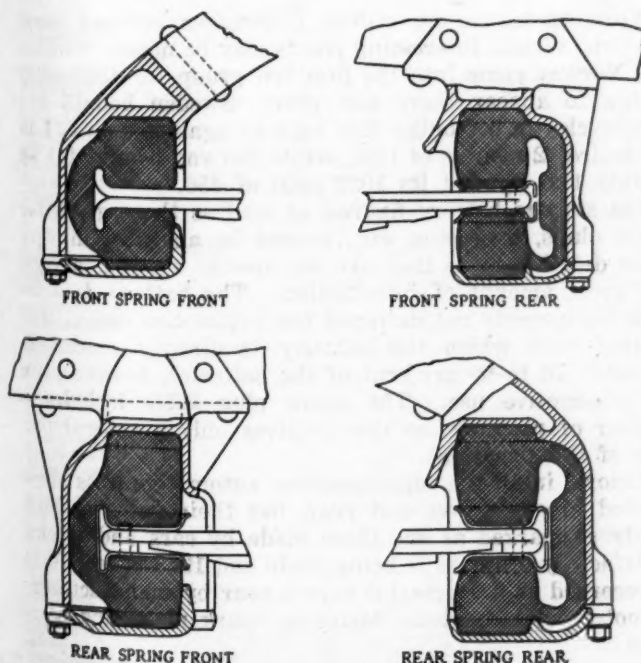
Rubber shock insulators are now being used as standard equipment on Mack trucks, Fifth Avenue buses, Yellow buses, Yellow cabs and the Sterling-Knight car.

Specifications for Leather Developed

THE leather section of the Bureau of Standards has completed a final draft of specifications covering rawhide for vegetable-tanned sole leather. These were prepared for presentation to the subcommittee on leather of the Federal Specifications Board. The approval of the Tanrers' Council committee has been secured, and an initial draft of specifications for three grades of upholstery leather has also been prepared. The data upon which these specifications are based have been prepared from an investigation which has just been completed upon upholstery leather samples submitted by automobile manufacturers.

The Bureau of Standards has placed an order with one of the rubber companies for the making of fifty tires, using various amounts of reclaimed rubber in the treads. After manufacture, these tires are to be tested in the laboratory and also on trucks of the Post Office Department over four different types of roads, so that the relative wear of the different compounds can be determined.

THE recent Industrial Heating Congress at Paris adopted a resolution calling for legislation making the "debenzolation" of coal gas compulsory and for the abandonment of the use of pure tar on roads.



Motorcycle and Tractor Exports Increase

Six months' figures are close to totals for entire year 1922. Gains also shown in storage battery, spark plug and magneto shipments. Growth of foreign sales satisfactory in all lines.

By Norman G. Shidle

EXPORTS of various automotive products, exclusive of cars and trucks, in 1923 will be over 50 per cent higher than the 1922 totals, if the shipments made up to July 1 can be used as a criterion. The six months figures for motorcycles, tractors, storage batteries and spark plugs approach closely those for the whole year of 1922 and there is every indication that the last six months of this year will be as good as the first six in foreign fields.

The relation between 1922 and 1923 shipments can be shown briefly as follows:

TRACTORS		
	No.	Value
1922 (12 mo.)	12,585	\$5,950,712
1923 (6 mo.)	10,229	5,714,907
1923 (12 mo. estimated)	20,500	11,480,000

MOTORCYCLES		
	No.	Value
1922 (12 mo.)	15,976	\$4,028,742
1923 (6 mo.)	12,100	2,814,023
1923 (12 mo. estimated)	25,000	5,800,000

STORAGE BATTERIES		
	No.	Value
1922 (12 mo.)	110,955	\$1,472,692
1923 (6 mo.)	92,737	1,224,360
1923 (12 mo. estimated)	185,000	2,442,000

SPARK PLUGS, MAGNETOS, ETC.		
		Value
1922 (9 mo.)		\$838,782
1923 (6 mo.)		649,214
1923 (12 mo. estimated)		1,300,000

While the actual number of units exported is increasing materially in all lines, considerable difference exists in the relative gain in values. The average value of tractors sent abroad increased from \$450 in 1922 to \$560 for the first half of 1923. Average motorcycle value dropped, however, from \$252 to \$232.

1923 Totals Estimated

The estimated value of total 1923 exports in the tables above was based on the average value shown for shipments up to July 1, 1923. Assuming that these estimates for 12 months of 1923 are approximately correct, the following relations appear between number and value increases:

Motorcycle exports probably will increase 56 per cent in number but only 44 per cent in value.

Tractor exports probably will increase 64 per cent in number and 93 per cent in value.

Storage battery exports probably will increase 67 per cent in number and 65 per cent in value.

Spark plug exports probably will increase 55 per cent in value.

Detailed tractor figures show that each of the three types of tractor are being shipped abroad this year in about the same proportion as in 1922. Last year, of all the tractors exported 3.8 per cent were garden; 92 per

cent were wheel; and 4.2 per cent were track laying. Six months figures show the 1923 percentages to be running as follows: Garden, 3.5; wheel, 92; track laying, 4.5.

There has been no radical upward revision of tractor prices in the past year, so that the relatively great increase in tractor export value cannot be accounted for on that score. It appears, therefore, that a greater proportion of heavy tractors are being exported this year, with a consequent decrease in the number of small types being sold abroad.

Motorcycle Value

The relative decrease in motorcycle value is accounted for by the drastic price reductions which took place toward the end of 1922. These cuts undoubtedly helped to increase the number of two-wheeled vehicles marketed to foreign countries and aided motorcycle export trade very considerably.

Only slight changes have taken place in the destination of motorcycle exports this year. These are shown by the following list of the ten countries absorbing the greatest number of American motorcycles in 1922 and in the first half of 1923 respectively:

1922 (12 mo.)		1923 (6 mo.)	
1. Australia	3,706	Australia	2,541
2. Netherlands	2,251	Netherlands	1,503
3. Belgium	1,027	Sweden	811
4. Italy	953	Italy	756
5. New Zealand	806	New Zealand	734
6. Spain	793	England	690
7. Japan	735	Japan	531
8. Canada	711	Canada	503
9. England	591	Belgium	453
10. British S. Africa	547	Norway	421

While there are no radical differences between these two lists, several interesting points may be noted. Sweden and Norway came into the first ten group for 1923 after failing to appear there last year. Sweden bought 811 motorcycles in 6 months this year as against only 427 in the entire 12 months of 1922, while Norway bought 421 up to July 1 as against its 1922 total of 456.

The storage battery figures, as well as those given for spark plugs, magnetos, etc., cannot be analyzed in very great detail because they are not specific enough to yield any great amount of information. The battery data include equipments not designed for automotive use as well as that with which the industry is directly concerned. Probably 75 to 80 per cent of the batteries, however, are for automotive use. The spark plug table includes a number of products, so that it gives only a general picture of the situation.

Exports in all the supplementary automotive lines show decided progress over last year, but their gains are not nearly so marked as are those made by cars and trucks. Satisfactory progress is being made and 1923 is certain to be recorded as a successful export year by manufacturers of motorcycles, tractors, batteries, spark plugs and magnetos.

Six Months Tractor, Motorcycle, Battery and Spark Plug Exports

COUNTRIES	TRACTORS							MOTORCYCLES			STORAGE BATTERIES		Spark Plugs and Magneto Value
	Garden		Wheel		Track Laying		Parts	No.	Value	Parts Value	No.	Value	
	No.	Value	No.	Value	No.	Value							
Europe													
Austria.....								63	\$15,473	\$1,137			
Azores and Madeira Islands.....							\$8	5	1,304	186			
Belgium.....	7	\$5,696	688	\$245,993	46	\$31,472	12,933	483	102,804	17,613	2,210	\$24,305	\$13,297
Bulgaria.....							40						
Czechoslovakia.....							92	260	64,327	12,639			358
Denmark.....			407	146,320			18,874	401	90,926	55,726	7,834	105,515	2,973
Estonia.....			81	30,190	2	1,370	1,925	17	5,439	1,193	4	135	3,759
Finland.....	1	175	102	36,673			854	162	37,303	9,121			1,813
France.....	1	159	597	221,620	10	7,943	38,500	315	61,310	31,843	6,020	47,584	29,018
Germany.....			16	16,187	1	1,739	2,238	77	15,381	2,205	100	1,600	
Gibraltar.....			1	900									
Greece.....													
Iceland and Faroe Islands.....			7	1,970				1	312		50	809	
Italy.....			150	52,049			18,155	756	172,129	18,443	25	144	257
Latvia.....	51	8,404	226	99,342			2,131	11	3,363		101	842	9,089
Lithuania.....			4	3,000			384				40	153	
Malta, Gozo and Cyprus.....			10	3,682									
Netherlands.....			4	1,697	22	13,300	460	1,503	368,379	41,471	486	5,426	1,341
Norway.....			15	5,466			523	421	100,168	29,878	409	5,145	2,235
Poland and Danzig.....	2	259	50	15,149			6,217	18	4,379	17,802			
Portugal.....			1	929			407	48	14,466	4,888	141	1,706	2,355
Romania.....							824	1	294	1,563	1	25	
Russia.....			347	146,264	2	15,850	19,171						
Spain.....	20	5,925	271	98,406	9	6,375	9,935	271	73,263	9,112	4,353	52,105	23,229
Sweden.....			30	10,536			9,464	811	191,034	39,873	525	9,374	10,459
Switzerland.....							574	241	53,894	5,762	89	1,210	34
Turkey.....	15	5,550	31	11,776			1,065						135
Ukraine.....			141	54,825			16,808						
England.....	23	4,062	700	269,555	11	15,169	42,413	690	154,987	49,452	5,360	100,281	26,337
Scotland.....					2	1,708	270				45	525	841
Ireland.....							335						
Yugoslavia, Albania and Fiume.....								12	2,936		98		
North and South America													
Canada.....	28	9,943	2,782	1,762,868	30	66,424	285,019						
British Honduras.....	9	2,882	34	27,778	8	27,252	7,153	503	111,061	102,518	11,294	136,366	264,617
Costa Rica.....							412				7	160	796
Guatemala.....			3	2,482			38	17	4,331	1,224	53	1,273	140
Honduras.....			15	18,999	4	11,951	1,756	13	2,002	232	119	1,470	359
Nicaragua.....			2	1,248	1	2,750	4,757				54	676	2,674
Panama.....							2,301	3	735	1	89	1,218	821
Salvador.....			1	720						63	471	6,384	568
Mexico.....	88	7,750	89	45,365	12	36,480	76,904	38	8,042	15,479	241	3,278	302
Miquelon, Langley and St. Pierre.....										142	2,514	49,360	12,990
Newfoundland and Labrador.....							698				104	1,624	1,356
Barbados.....	2	340	1	351			47	1	100		53	540	1,014
Jamaica.....			1	374			738	4	887	371	341	5,082	569
Trinidad and Tobago.....			4	1,461			935	7	913	128	223	3,067	1,682
Other British West Indies.....	7	1,190	1	351			247	7	1,641	3,459	109	1,571	493
Cuba.....	10	5,270	237	119,458	15	60,731	47,086	23	4,824	17,371	3,401	55,592	13,631
Dominican Republic.....			13	4,662	1	500	6,751	12	1,788	1,592	150	1,674	1,560
Dutch West Indies.....								2	452	133	8	176	155
French West Indies.....			9	3,360			841	1	130		19	221	122
Haiti.....											82	1,923	73
Virgin Islands.....	1	170					114	1			31	241	36
Argentina.....	47	15,389	665	499,501	3	14,855	49,484	131	31,713	17,455	16,902	165,285	36,814
Bolivia.....			2	703				43	11,309				
Brazil.....			171	60,551			6,626	37	9,173	2,140	5,272	62,934	9,680
Chile.....			37	14,566			7,042				364	12,951	5,006
Colombia.....	3	621	15	9,146	7	4,972	28,268	4	1,400	643	162	3,117	3,423
Ecuador.....			8	6,366	3	3,285	919				64	1,455	1,017
British Guiana.....			20	7,268	1	3,513	278	1	142	8	66	716	800
Dutch Guiana.....							191			35			640
French Guiana.....													41
Peru.....			13	8,124			25,426	3	388	564	783	6,646	1,945
Uruguay.....	19	1,630	65	28,431			4,436	13	3,785	4,055	1,625	13,629	1,153
Venezuela.....			3	1,032	4	23,313	35,899	7	1,665	645	129	2,378	2,570
Asia													
Aden.....							175						
British India.....			13	13,774	15	31,246	20,932	134	30,981	10,799	3,166	30,105	7,032
Ceylon.....							173	20	5,477	740	83	1,212	1,090
Straits Settlements.....					1	1,440	1,246	8	1,578	1,880	697	10,304	12,653
Other British East Indies.....							25	1	124	1,362			
China.....							111	43	11,603	1,138	976	21,351	2,999
Chosen.....										136			750
Java and Madura.....			1	576			4,251	104	20,228	17,071	833	13,791	5,507
Other Dutch East Indies.....							13,349			2,265	36	661	507
Far Eastern Republic.....			6	6,130			742				3	27	
French Indo China.....													
Hejaz, Arabia and Mesopotamia.....							15	3	600	276			
Hongkong.....											25	300	
Japan.....	25	5,146	27	11,269	14	34,891	3,938	44	8,199	1,011	56	1,389	1,599
Kwantung.....								531	104,999	83,021	642	20,122	42,072
Palestine and Syria.....			15	8,118			1,663	1	291	12	13	117	89
Philippine Islands.....	1	223					13,017	30	6,033	5,721	411	16,050	2,460
Russia.....										61			7,295
Siam.....							191	1	151		7	617	216
Turkey.....			1	659			470						24
Oceania													
Australia.....	13	10,424	1,190	793,460	173	199,277	66,258	2,541	600,875	129,661	7,020	96,883	40,064
British Oceania.....							1,762	7	936	191	163	2,272	177
French Oceania.....			4	1,600			30			220	8	167	100
New Zealand.....			9	4,703			8,648	734	178,846	47,535	2,827	43,583	12,939
Other Oceania.....								1	290	57	13	280	186
Africa													
Belgian Congo.....			4	1,853			1,628			203			
British West Africa.....			1	1,025			143	5	1,038	130	15	197	3,634
British South Africa.....			1	2,100	2	1,437	3,369	398	94,697	29,436	2,955	61,651	6,514
British East Africa.....					29	17,693	782	2	750	996	79	1,605	84
Canary Islands.....								1	250		78	1,477	370
Egypt.....							1,401	34	7,567	2,322	52	1,074	2,109
Algeria and Tunis.....			25	15,717	16	13,210	3,645	3	444				43
Other French Africa.....								8	1,547	317			110
Liberia.....													46
Morocco.....			44	15,455			2,467	35	5,373	468	24	316	811
Portuguese East Africa.....							20						
Other Portuguese Africa.....							1,586	3	645	217	1	30	157
Spanish Africa.....										400			
Total.....	373	\$91,208	9,412	\$4,973,553	444	\$650,146	\$951,003	12,100	\$2,814,023	\$858,080	92,737	\$1,224,360	\$640,214



The FORUM



More Than One Way to Obtain Engine Balance

Two power plants of radically different construction may both be relatively free from vibration. V-type eights are discussed.

Editor, AUTOMOTIVE INDUSTRIES:

The real answer to the question of engine balance in motor cars may be summed up as follows:

If there is no drumming which requires cotton wool in one's ears or no vibration which puts the hands and feet to sleep—the engine is said to be in balance!

Now, it is quite possible to attain the desirable results outlined above with a variety of types of motors, and the results obtained in various cases depend on the skill and forethought which the designer brings to bear on the question of engine and car design and on the accidental happy combination and arrangement of elements which may be incident to the design through no very conscious effort on anybody's part. This last statement looms very large in the eyes of anyone who may have spent some years studying the balance of the machines in general, and the transmission of sound and vibration, or to be brief, the question of resonance.

Nature, even in inanimate things, is far too complex to permit of more than remote generalizations as to what may be the truth with regard to this property or that activity. Mechanics and mathematics give only a general indication of what may be true and sometimes tell us in what direction to look for a solution in the matter of engineering problems.

Two Cars Compared

As a point in case, the writer has recently had the pleasure of driving over some hundreds of miles two cars of similar size, power and activity. One of these cars is equipped with an L-head straight eight motor having a nine bearing crankshaft with the crank set so as to give certain theoretically desirable results in the matter of engine balance. The other car in question has an overhead valve straight eight motor with a nine bearing crankshaft. The cranks are counterbalanced in plane and set so that the secondary forces of the two tandem four-cylinder motors produce a rocking couple about the center of gravity of the motor.

Now, both of these cars are very pleasant to drive; they are reasonably quiet and free from vibration compared to the majority of other cars, but the car with the overhead valve motor and the unbalanced secondary force couples is certainly smoother in operation—as testified to by a variety of people who have ridden in these cars, and among them are some very expert women drivers. There is obviously more than one way to attain desirable re-

sults in the matter of engine balance, as viewed from the driver's seat.

Reforms in engineering matters are certainly as slow in developing as in most other branches of human activity and depend in a large degree on the prestige of people or firms indorsing them, and almost not at all on truth contained in generalizations or specific deductions looking toward reform, put forward by earnest seekers after truth.

F. W. Lanchester many years ago put forward some ideas with regard to engine balance. Two questions in particular were considered at some length: The want of balance in four-cylinder, four-crank engines and torsional vibration in six-cylinder, six-crank engines. His solution of the problem of balancing four-cylinder, four-crank engines has been adopted by one firm (of more than a hundred) building four-cylinder cars, rather more than ten years after the original presentation of the matter. His vibration damper for six-crank engines has had more general adoption, since some of the larger six-cylinder engines simply ate timing gears and chains alive.

There are several producers of four-cylinder cars in this country whose output per day average from 200 to 1000 cars. Most all of these cars drum and vibrate outrageously; some of them at all speeds of operation, others at quite definite intervals of speed, usually at the most usable speeds. In open cars the offending members are the steering column, fenders and splashers, hoods, and in some cases the floor boards raise a terrible din. A day's drive in one of these massage machines certainly leaves one in a very fatigued condition. In closed cars the drumming set up is positively unbearable, particularly when the weather is inclement, requiring the windows to be closed. These large lights of glass act as powerful resonators.

Now, it is quite out of the question to balance the torque reaction of any motor car engine, and since the very general adoption of high speed engines, torque reaction is only objectionable at speeds below ten miles per hour in the case of four-cylinder cars and is not at all objectionable in cars having more than four cylinders.

The Lanchester harmonic balancer will very positively damp all periods which are the result of the secondary unbalanced forces and the resiliency of the supports on which the engine rests. Mechanical elements introduced into the scheme of the engine lend themselves to a very convenient arrangement and are inherently possessed of a high degree of reliability in operation.

Since the total cost of introducing the harmonic balancer into a four-cylinder engine should not exceed the

price of a spare tire, it is difficult to account for the omission of this element in four-cylinder motor cars, except on the grounds that the engineers and manufacturers are unaware of the possibilities of this device.

As to the balance of inertia forces in V-type eight-cylinder motors:

Up to the moment only two types of cranks have been used in 90-deg. eight-cylinder motors which have yet found their way on to the market. In one type the cylinder, pistons and rods are arranged symmetrically in the plan of the motor in reference to one another. This type of motor has only the horizontally oscillating resultant of the secondary inertia forces as the cause of vibration, and has for its value the following expression:

$$R = M\omega^2 r n (\cos^2 \alpha_1 - \sin^2 \alpha_1 + \dots \cos^2 \alpha_n - \sin^2 \alpha_n) \sqrt{2}$$

in which

$$M = \frac{\text{mass of reciprocating parts} = \text{weight}}{\text{acceleration of gravity } G}$$

ω = angular speed of crank in radians per sec.

r = crank radius

$$n = \frac{r}{l} = \frac{\text{crank radius}}{\text{con. rod length}}$$

α = the angle of the crank in relation to the direction of piston stroke of one block of cylinders

R = resultant force.

Now let γ = the angle of the resultant force with relation to the piston stroke of the left bank of cylinders (clockwise rotation).

$$\text{Then } \tan^2 \gamma = \frac{(2n \cos 2\alpha)^2}{(-2n \cos 2\alpha)^2} = \pm 1$$

whence $\gamma_1 = 45^\circ$ and $\gamma_2 = 135^\circ$.

It is not generally appreciated that the unbalanced forces in the ordinary eight-cylinder 90 deg. motor are about 1.41 times the unbalanced force of a four-cylinder motor having pistons weighing each the same as one of the eight-cylinder pistons—the result here being masked by the improved torque characteristics of the eight-cylinder motor.

In another type of 90 deg. eight-cylinder motor the cylinders are arranged unsymmetrically in the plan in reference to one another, thus introducing a set of unbalanced couples whose magnitude varies with the arrangement of the cylinders in respect to the transverse central plane of the motor, but these couples have small effect on the balance of the motor as a whole.

Both of these 90 deg. V eight-cylinder motors can be almost completely balanced by the Lanchester harmonic balancer set in proper relation to the crank shaft, but the writer knows of no single case in which this has as yet been done.

In the 60 deg. V eight-cylinder motor the direction of the resultant unbalanced force varies uniformly with respect to the cylinder axis (moves in a circle). The magnitude of the force is, however, very considerable.

This motor can be balanced by two Lanchester harmonic balancers set in proper relation to the crank, but the arrangements would no doubt present considerable difficulty.

Advantages Cited

The advantages of this type of motor are entirely in the matter of arrangement with respect to the width of the frame, hood and radiator and perhaps present some improvement in accessibility with respect to the accessories. Where a single cam shaft is used in the 60 deg. V type eight for the operation of the valves, particularly in the

L-head type, a compromise is introduced into the manifolding.

In addition to the four-throw shaft for 90 deg. V type eight-cylinder motors with cranks set 180 deg. apart there are many other forms possible, one of which merits the attention it has not received in the past. The cranks are set 90 deg. apart so that cranks 1 and 4 are opposed; 2 and 3 are opposed and set 90 deg. from 1 and 4. The primary and secondary forces are in complete balance and there remains only an unbalanced couple whose magnitude varies but little and whose direction varies but ununiformly. If the cylinders of one block take the numbers respectively 1, 3, 5, 7, and of the other block 2, 4, 6, 8, and the cranks are set

$$\alpha_1 = 0, \alpha_2 = \frac{\pi}{2}, \alpha_3 = \frac{3\pi}{2}, \alpha_4 = \pi,$$

we get 1, 2, 7, 8, 4, 5, 6, 3, as the one and only desirable firing order, which is nearly free from the possibility of inducing resonance in the chassis.

As to whether resonance is produced or not in the case of any motor depends only on the harmonics present, the weight of the motor and the flexibility of the supports on which the motor rests, the theory having for its basis d'Alembert's principle and a Fourier series of harmonics.

The resultant for the shaft mentioned above is

$$R = 2M\omega^2 r \sqrt{(\alpha_1 \cos \alpha - \alpha_3 \sin \alpha)^2 + (\alpha_1 \sin \alpha + \alpha_3 \cos \alpha)^2}$$

where $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ are the distances of the symmetrically placed cylinders from the transverse plane through the center of the motor.

E. H. SHERBONDY.

Local Tire Dealer Important

Editor, AUTOMOTIVE INDUSTRIES:

Your article in the July 19 issue of AUTOMOTIVE INDUSTRIES entitled "Dealer Needs of Major Importance in New Tire Marketing Era" has been carefully studied by the writer.

I believe the suggestion outlined in this article is very interesting, where the manufacturer can cut down his overhead by reducing expensive factory branches.

In view of the fact that practically all responsible tire manufacturers are doing nearly all of their business through the dealer, there is no need of these expensive items being carried in the manufacturers' businesses. A warehouse is a logical place for manufacturers to keep stocks. By doing this they would eliminate factory branches which have heretofore been maintained at a very big expense.

The local tire dealer should be the important factor in the distribution scheme.

The tire industry is at the present time going through a crisis, but good will have to come from all these upheavals, for the benefit of the consumer, the dealer and the manufacturer.

GEORGE J. BURGER, President,
National Tire Dealers' Association.

METHODS of repairing aluminum sheet and castings and attaching copper, brass and steel to aluminum by tinning, sweating and burning processes with sheet iron jigs, are presented by William H. H. Platt, in a little volume entitled "Aluminium Repairing," recently published by Crosby Lockwood & Son, London.

The book is plentifully illustrated with working drawings and the text deals for a small part directly with automotive repair work.

"Aluminium Repairing" is offered in this country by D. Van Nostrand Co., New York.

Uniform Traffic Laws Are Needed

Variation in Regulations Make Driving Much Less Pleasant for the Tourist

By Harry Tipper

JAMES CHANCE, sales manager of the Planet Motor Car Company, took his chair at the luncheon table impatiently and sat down as though his morning had been disturbed.

"I don't know what we'll be up against in this business," he remarked impersonally to the others, "if they don't do something about these traffic regulations. Why, it's fierce! Apparently, these villages and towns can change their routing any time and muddle a motorist up any time they feel like it."

"Get pinched this morning, Jim?" asked Billings, the president.

"No, I didn't, but I got pinched yesterday," Chance replied, "and it was an outrage."

"I thought that burst of eloquence couldn't have been induced by mere abstract knowledge, Jim," the president countered. "However, suppose you get it off your system. We should be about as sympathetic a crowd as you could find."

Chance grinned. "A lot of sympathy you birds have to give away. I have been as mad as a wet hen all morning. You know my place at Shimmer Lake. I was there last week and decided, as yesterday was Labor Day, I'd get down ahead of the crowd. You know that it's fifteen or twenty miles of stop and go if you get mixed up with the late crowd. So I cut out a fine party to get away early in the afternoon. Well! with one thing and the other, I was not as early as I might have been but still I was in plenty of time to beat the crowd. I knew all the village cops would be out, so I'd taken note of all traffic signs in the villages on the way and felt I was thoroughly posted.

Ahead of Schedule

"Up to the time I reached Shaker, about half way, where there is that stretch of rotten road, I was well ahead of schedule but right then I got it in the neck. I was running quietly through one of the main streets when the cop pulled me. He said I was running the wrong way on a one-way street. I asked him how long it had been a one-way street and he said they changed the regulations on the previous Friday because of the expected crowds. They were sending the cars north on one street and south on the other. I called his attention to the cars parked both ways on the sides of the streets and some jitneys going the wrong way. Then he informed me that the rule was for through traffic only and signs were placed to inform the drivers. Of course, it was a plain hold-up but I could do nothing. He wouldn't listen to reason. I was pinched and it cost me two hours and twenty-five dollars to get back on the road again.

"Just about the time I should have been putting the

JIM CHANCE, the Planet sales manager, was caught in a Labor Day traffic jam and expresses some very frank opinions about local ordinances and officials. He gets a little sympathy and some constructive ideas from his associates when he tells them about his experiences.

car in the garage, I was headed out of court minus twenty-five dollars and all the natural sweetness of my disposition.

"By that time the traffic was thick and it kept getting thicker until it was just one line about fifteen miles out of the city. I figured on being home at six o'clock. I actually reached there at ten p.m.

"They were operating a new stunt at one village about ten miles out. Once in a while some fellow would try to edge around and steal a new place in the line. Each time that happened the cop would pinch him and he would be fined ten dollars besides losing a lot of time.

"What's going to happen to the automobile business if they are going to go on in that way?

"Any regulations any village wants to adopt can be enforced whether you ever heard of them or not. You never know what you will hit, and you can't drive with any pleasure when the cars are running only a few feet apart. Something ought to be done about it. It's spoiling the entire business."

Speed Regulations Annoying

"I might have more sympathy with you, Jim," said John Carter, "if I didn't know your method of driving so well. I am annoyed more than anything else by the speed regulations. You can get everything from eight to thirty miles an hour demanded in a short drive. Of course, everybody tries to beat the game and the whole thing is a huge joke. Something certainly ought to be done about it, as you say."

"There's a good deal in what Jim says, though," said President Billings, "and it's something we have been talking about for years. The trouble is we don't do anything much about it. We need uniform speed laws, some orderly arrangements of traffic, parking and a lot of other things. Do you suppose the politicians are interested in studying the question? You don't imagine that the individual motorist is ready to spend any time organizing any kick on them do you? All the time he wants to spend on the matter is the yearly minute or two in the polling booth. We have our committee of the manufacturers and the dealers' organizations have committees, but the job is far bigger than that."

"This is a pretty big industry and a lot of people are interested in it," put in the advertising manager. "In every town and village there are dealers or garages, and the automotive retailer talks with nearly every man of any standing in the community. That sounds like a pretty good piece of machinery for getting something done.

"When the Associated Advertising Clubs started its campaign against fraudulent advertising, it found the same condition prevailing. Different laws in different

States and no uniformity. The clubs got up a model bill, organized a program whereby the local bodies could get busy and almost all the States have uniform legislation on the subject now. Why can't the automotive industry do something like that? It has a much wider organization and a much more interesting subject to work on."

"That's fine, Henry," said President Billings. "The trouble is that a lot of men must put in a lot of time and labor in order to get some plans. It would be a wonderful thing if we had a model speed law and a model traffic basis in all the States, but it is a complicated matter and, in order to work it out, you would have to enlist every local dealers' organization in the country. You would have to tell them what to do and see that they did it."

"You would have to do the same thing with the manufacturers' organizations. It can be done, but how many of us at this table would accept a job on such a committee? Every other man is in the same boat. He wants it done but he cannot spare time to do it, so we go muddling along from one thing to the other."

"Meantime, as Jim, here, says, it is getting more and more difficult to park, to ride and to drive a car through the centers of population. Physical saturation is much more likely than economic saturation and we do not know what this will do to the future of our business. At that, I think it would pay us as manufacturers to devote a certain sum of money, assessed on each factory, to the development of such a plan. I am inclined to think that the local dealers' associations would do some real work if we could give them a plan of action to go on."

"Perhaps we can stir up enough interest among the manufacturers to start something. It is obvious that it would be up to us as manufacturers to spend the money, investigating and laying out plans for the organization and operation. It would not mean a great deal to any of us, but it would make a lot of difference publicly."

"I agree with you, Jim; something should be done and, as we are vitally interested in keeping the car wheels rolling, we should spend some time and money investigating some of the problems involved."

Novel Operating Mechanism on New Front Wheel Brake

A NEW French front wheel brake, known as the Wattel, has been brought to this country by William A. Schuyler. The accompanying photographs show the brake assembled on the front wheel and also the parts of same. The novel features reside in the brake operating mechanism. A lever with a helical face cam is pivoted on a flanged stud mounted on top of the yoked axle end, co-axial with the knuckle pivot. This stud is provided with splines which correspond to spline slots in the bore of a piece capable of sliding along it. The lower edge of this sliding piece, by means of lateral extensions, rests on the helical surfaces of the cam, while its top part, which is of the form of the zone of a sphere, presses against rollers carried on the ends of the brake segments. By turning the brake operating lever the sliding piece can be raised or lowered, thus expanding or contracting the brake shoes. The whole mechanism is inclosed in a housing with a cap for the introduction of grease for lubrication.

Deflection of the wheels for steering has no effect on the hold of the brake, as the contact points of the rollers describe a circle on the spherical zone. In order to adjust the brake after the lining has become worn, the sliding piece is turned around on its mounting through an angle corresponding to one spline. It is claimed for this brake that it is less expensive to manufacture, easier to keep

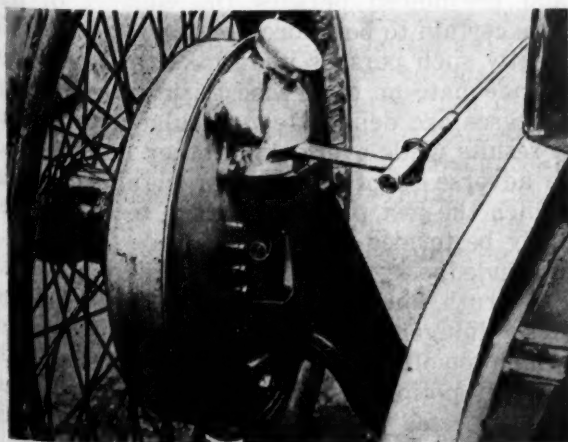
in proper adjustment and less subject to wear than other types.

M. Wattel does not believe in means for varying the pressure of application of the two front brakes, relative to each other, when the wheels are turned for steering.

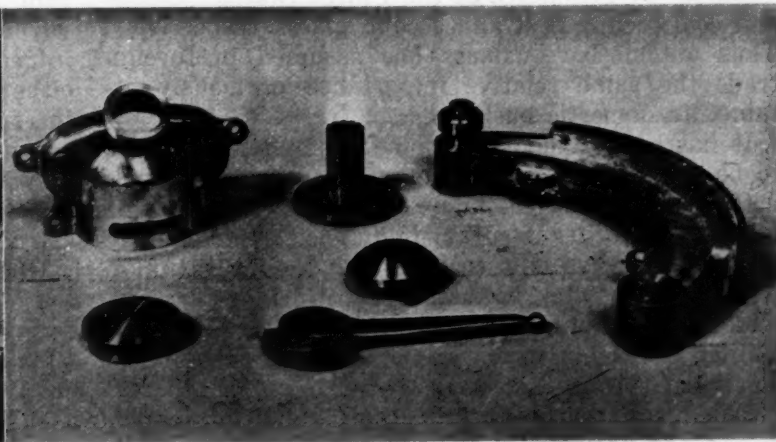
American Cars Now Able to Compete in Austria

AMERICAN cars of a high grade as well as those of low price find themselves now able to compete in the Austrian market because of the fact that import duties are assessed on the basis of weight. In the case of high grade cars duties sometimes amount only to 6 or 7 per cent ad valorem, but for the majority of cars imported the duty is 10 to 20 per cent ad valorem.

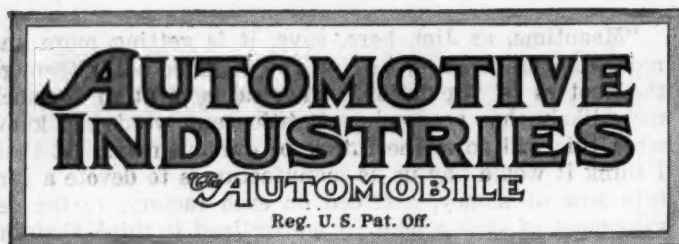
Austrian manufacturers, therefore, are pressing for an amendment of the Austrian tariff law which will put all duties on an ad valorem basis of 33 1/3 per cent, and expect that it will be granted very soon. This would be disadvantageous for the American high grade cars but would help those of low price, which now pay the equivalent of 38 to 45 per cent ad valorem.



Wattel Brake on Front Wheel.



Chief Components of Wattel Front Wheel Brake.



PUBLISHED WEEKLY
Copyright 1923 by The Class Journal Co.

Vol. XLIX Thursday, September 13, 1923 No. 11

THE CLASS JOURNAL COMPANY

Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
David Becroft, Directing Editor
U. P. C. Building, 239 West 39th Street, New York City

BUSINESS DEPARTMENT
Harry Tipper, Manager

EDITORIAL
James Dalton, Editor
Norman G. Shidle, Managing Editor
P. M. Heldt, Engineering Editor
Herbert Chase, Engineering Editor

DETROIT OFFICE WASHINGTON OFFICE
J. Edward Schipper 26 Jackson Place, N. W.

BRANCH OFFICES
Chicago—Mallers Bldg., 59 East Madison St., Phone Randolph 6960
Detroit—317 Fort Street, West, Phone Main 1351
Cleveland—538-540 Guardian Bldg., Phone Main 6432
Philadelphia—1420-1422 Widener Bldg., Phone Locust 5189
Indianapolis—1212 Merchants Bank Bldg., Phone Circle 8426

Cable Address.....Autoland, New York
Long Distance Telephone.....PENnsylvania 0080, New York

United States and Mexico.....One Year, \$3.00
Extra postage west of the Mississippi River on account of Zone Postage Law 0.50
CanadaOne Year, 5.00
Foreign CountriesOne Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order or Register your letter.

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; A. C. Pearson, Treasurer; Fritz J. Frank, Secretary.
Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Member of Associated Business Papers, Inc.
Member of the Audit Bureau of Circulations.
Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly) July, 1907.

Automotive Exports in Third Place

AUTOMOBILES and their parts have taken third place in exports, according to the quarterly analysis of foreign trade, issued recently by the Chamber of Commerce of the United States. Cotton and coal occupy first and second places respectively. Thus automotive business has assumed in foreign trade the same relative importance previously attained in domestic business.

It has been evident for some time that 1923 was to be an excellent export year for automotive products, but the progress made as compared to that of other commodities is surprisingly good. Particularly is this true when it is realized that the figures upon which this showing is based do not include tractors, motorcycles, storage batteries and other items of a similar character which are properly a part of the automotive trade.

This record has been made despite conditions which have made nearly all of Central Europe a blank so

far as buying power is concerned. Manufacturers are giving more attention to foreign fields than ever before and are cultivating them in a more constructive way. The high place which automotive exports have taken bear ample witness to the excellence of the results which are being achieved.

A Practical View of Research

ARATHER unusual but quite practical view of the attitude which an investigator should take toward research is contained in the following remarks made recently by Harry R. Ricardo in presenting before a student section of the British Institution of Automobile Engineers a paper dealing with his own research activities:

"We are taught that we should always approach research with a perfectly open mind and without any preconceived conclusions. Like so many other idealist doctrines, this is not compatible with human nature. Only the super-man can combine keenness and enthusiasm with a perfectly open mind. We have to deal with human nature as it is, and the author has come to believe that it is even desirable to encourage his staff to form definite conclusions in advance as to the outcome of any piece of research, and even to go so far as to write a full report upon it before it has been carried out, of course, not for publication outside our own circle. This insures that the problem has been well thought out and a definite plan of campaign prepared. He does not find that well-educated, intelligent people show any undue tendency to cling to their prejudices in the face of contradictory evidence—in fact, they are always ready enough to discard them in the light of any new development. The time lost in weaning anyone away from his initial conclusions is as nothing to that which may easily be lost floundering in the dark with a perfectly open mind."

We believe that few practical investigators will take issue with these conclusions, though it may well be contended that they apply more particularly to testing work of more or less routine character rather than to original investigations, the outcome of which it is frequently difficult if not impossible to anticipate. In the latter case the investigator may well start with a quite definite plan of procedure laid down only to find that early results make alteration of the plans imperative.

The real danger lies, of course, in trusting to ignorant and prejudiced persons the conduct of tests which are certain to be colored by the prejudice. Not infrequently such persons undertake tests which are either inadequate or otherwise misleading or which in some cases are deliberately calculated to produce certain results while overlooking other factors which may be adverse or of far greater significance than those which the test produces. Such tests, however, can hardly be termed research.

Open-mindedness is indispensable in any real search for truth, but it should not be allowed to interfere with intelligent planning or to a blind waste of effort which too often results from mere testing without any clear notion as to the truths which the test should be expected to yield or the procedure which must be followed to secure the desired information.

Methods of Balancing Inertia Forces in Multi-Cylinder Engines

IN designing a multi-cylinder engine for use on passenger cars the engineer generally aims to secure three features, viz., uniform sequence of explosions, elimination of rocking couples and elimination of unbalanced primary and secondary inertia forces. In certain types of engine, such as the six-cylinder and eight-cylinder vertical, these ideals may be completely attained, but risk of trouble from torsional vibration arises unless crankshafts are made very heavy or other safeguards are provided.

The 90 deg. Vee type eight single plane crankshaft is open to two generally recognized objections: it has a rather large unbalanced inertia force in the horizontal plane and owing to its width makes difficult the installation of certain parts where they will be readily accessible. Attempts to overcome these disadvantages led first to the production of the 60 deg. Vee engine, which is materially narrower than the 90 deg. type and therefore permits of the use of a narrower hood and also facilitates the installation of the accessories. There is an unbalanced inertia force in this type also, but instead of reciprocating along a horizontal line it rotates in a vertical plane and its constant value is substantially less than the maximum value of the reciprocating force in the case of the 90 deg. Vee engine.

Presumably the vibration resulting from this rotating force is less pronounced than that from the horizontally reciprocating force, owing to the smaller magnitude of the former force. But there is no direct method of comparing the resulting vibrations, because the unbalanced force is only one factor determining the amplitude of the vibration, the others being the mass of the body set into vibration and the rigidity with which it may be secured to other masses. In the 60 deg. Vee engine

the apparent gain in respect to vibration has to be paid for by the disadvantage of inequality in the sequence of explosions.

The latest idea in respect to eight-cylinder Vee engines consists in combining with the 90 deg. Vee feature a four-throw crankshaft with throws at 90 deg. It can be shown that in such an engine the unbalanced free forces in a transverse plane are completely balanced, and this is exactly what would be expected in view of the arrangement of the cranks at 90 deg. What is surprising, however, is that all rocking couples can also be completely eliminated.

An engine of the type referred to consists essentially of four two-cylinder, 90 deg. Vee engines, mounted end to end. In a two-cylinder 90 deg. Vee engine the primary unbalanced force can be completely balanced by means of a balance weight, suitably dimensioned, mounted opposite the single crank, thus leaving only the secondary unbalanced force to deal with. This is a periodic force of twice the period of crankshaft rotation.

That is, the force is of the same magnitude and in the same direction when the crank is at 0 deg. (say vertically upward) as when it is at 180 deg. (vertically downward). Then, by placing the two outer cranks at 180 deg. with each other their secondary unbalanced forces add together and the resultant of these forces passes through the middle of the length of the crankshaft. Similarly, the secondary unbalanced forces due to the two inner cranks (or, rather, their attached reciprocating parts) add together and their resultant is in the same line as the resultant of the forces on the outer cranks, but opposite to it in direction. Thus the secondary unbalanced forces also cancel out and there is no rocking couple.—P. M. H.

Producers Increase Activity This Month

Some Plants That Have New Models See Capacity Warranted for Sixty Days

NEW YORK, Sept. 10—Passenger car and motor truck manufacturing plants are showing increased activity in September following the setting of a relatively high production mark last month. The 348,733 cars and trucks estimated as August output was greater than the total for the preceding months and only a few thousand short of March, the month when the industry, for the first time this year, exceeded 300,000 in its monthly output totals.

The introduction of new models by some manufacturers and a reduction in prices by others have had a stimulating effect on sales. Orders on hand with many of the major companies, particularly those that have made changes in their products, are reported to be sufficient to warrant capacity operations for sixty days.

Capacity in Some Plants

Several plants advise operating at top speed and others that they expect to reach capacity levels this month. Ford, which dropped behind its schedule of 180,000 in August, incidental to bringing out its new models, is expected to return to the 7000 daily mark this month and maintain operations steadily at that figure, or in excess of it.

Sales in August were behind those reported in July except in half a dozen States, where improvement was noted. Advices received from chief distributing centers throughout the country indicate a good fall business. Commercial sections of the East report a picking up in business after a slowing down experienced in August. In certain parts of the South the prospects for increased sales of automobiles are excellent, retailers reporting encouragement from the cotton outlook. Georgia was one of the half dozen States in which sales were better last month than in the month previous.

Sales Better in Middle West

In the Middle West more favorable signs are apparent of increased sales. Iowa, for instance, reports higher prices for hogs, which, in turn, has placed the farmer in a better buying mood. Not only in that State but in other parts of the section farmers are purchasing cars, although not in the

Business in Brief

NEW YORK, Sept. 12—With the anthracite coal strike, the Italian-Greek dispute and the Ruhr situation well in hand and with the effects of the Japan disaster softened by later reports, the business world faces fall trade in a confident manner, which, however, is tempered with commendable caution. Fall buying, while under way, is slightly smaller and later than normal. Wholesale and jobbing trade is better than fair, but retail is a trifle slower.

Little change in crop conditions is recorded. Cotton and corn, while on the upward trend, are handicapped by the lateness of both crops. In the corn belt warm weather has helped mature the crop, there has been plenty of rain and from two to four weeks are needed to mature the crop.

Activity in the business world is indicated by the car loadings for the week ending Aug. 25, which totaled 1,069,932, a new high record. This marks an increase of 34,191 over the preceding week, 200,030 over a year ago and 240,223 over 1921.

An increase of seven-tenths of 1 per cent is reported in bank clearings over the preceding week, a total of \$5,569,060,000 being shown for the week ending Sept. 6, which was a holiday week. This is a decrease of 3.3 per cent over a year ago. Bank debits showed a decrease of 1.9 per cent.

The Japanese disaster affected the stock market, which rallied strongly after early declines. Bonds were irregular, time money and commercial paper firmer and exchanges heavy.

volume earlier anticipated. Country fairs, with their automotive exhibits, and various demonstrations in farming areas are doing much toward stimulating interest in automobiles, motor trucks and tractors. Sales are being made at these fairs.

Viewed solely from a business standpoint, the Japanese catastrophe has not affected the industry to a great extent. Other than with Ford, no American branch factories were established in the Empire and Ford's assembly plant at Yokohama was under the jurisdiction of a distributor in that city. It is felt that in rebuilding the demolished areas, streets will be widened and improved over the past, thus offering a greater market for the sale of American-made automobiles.

Ford Assembly Plant in Japan Destroyed

Main Headquarters in Tokio Damaged—Records Safe but Staff Suffered Loss

DETROIT, Sept. 12—Word by cable to the Ford Motor Co. from Sale & Frazar, its Japan distributors, report the total destruction of the Yokohama assembly plant, and serious damage to the main headquarters in Tokio, without, however, the destruction of records. One of the staff was killed and five are missing.

Destruction of the assembly plant will not interfere with Ford business, it is declared, as shipments of complete products will be made from the United States until the plant is restored.

The company is anticipating a considerable demand for trucks and tractors in the work of general construction in the ruined area. Passenger cars will not be in demand for at least some time, it is believed.

Little or nothing can be done in the way of preparing for resuming assembly for some time, but as general rebuilding begins, the distributors will make their plans for the starting of assembly work.

Allied Machinery Gets Cable

NEW YORK, Sept. 11—The Allied Machinery Co. of America of New York City has been advised by cable from T. G. Nee, president of the Horne Co., Ltd., of Japan that the entire head office staff of the latter in Tokio is safe.

None of the thirteen branches of the company in Japanese territory was affected by the recent disaster, and the Horne company is prepared to continue as distributors in Japan for American manufacturers of machine tools, industrial and construction machinery, etc.

The Allied Machinery Co. of America will continue to handle the affairs of the Horne company in this country.

G. M. C. Contributes \$50,000

NEW YORK, Sept. 11—The General Motors Corp. has contributed \$50,000 to the Japanese relief fund.

More Car Manufacturers to Adopt 4-Wheel Brakes

DETROIT, Sept. 12—Lockhead hydraulic four-wheel brakes will be announced as standard equipment on two leading cars within the next several weeks, it is learned from D. O. Scott, general manager of the Hydraulic Brake Co. These cars are in distinctly different price classes.

It is also learned that eighteen different manufacturers, making cars in all classes, have the hydraulic brakes under test on experimental cars.

Moline Plow to Sell Some of Its Holdings

Company Will Dispose of "Non-Integrating" Properties and Segregate Automobile Unit

MOLINE, ILL., Sept. 12—The second reorganization of the Moline Plow Co. since the war will segregate its Stephens automobile branch into a new and independent corporation with a capital of \$2,000,000, and result in a less pretentious organization of the Moline plant.

This new policy was adopted last week at an all-day session in Chicago, at which George N. Peek, president of the company, and other local directors were in conference with F. O. Wetmore, Arthur Reynolds, J. E. Otis and C. E. Mitchell, representing stock and bondholders of the concern.

No Shift in Personnel

It is announced that the changes will not mean a shift in the official personnel of the Moline Plow, but will result in the disposal of "non-integrating" properties of the company, like foundries and similar branches throughout the country. The funds from these sales will go into the central unit financing. The sale of the Midland Motor plant in East Moline recently was in line with this policy.

The Moline Plow Co., Inc., was launched in June of 1922 under a Virginia charter, to succeed the Moline Plow Co., an Illinois corporation, which had accumulated debts of \$25,000,000. The new company took up these obligations by issuance of 20-year 7 per cent debenture bonds for half the amount and 7 per cent cumulative first preferred stock for the other half. Directors several months ago announced that the Sept. 1 payment on the debentures could not be met and since then several meetings have been held in an effort to straighten out the tangle.

Automobile Plant at Capacity

No public financing of the Stephens Automobile Co. is anticipated at this time. The Freeport plant, which is the important automobile producing center, is reported to be operating at capacity, and the automobile unit apparently has enjoyed a prosperous year.

All the securities of the Moline company are in a 20-year voting trust held by the bankers' committee. The conference last week revealed that 1923 started off with every expectation of a successful season, and the first quarter's business was excellent, the half-year ended with slackened business, and recently operations have produced losses.

An official statement from the Moline office of the Plow Co. relating to the Chicago meeting says:

The properties of the company include a tillage, wagon and seeding machine business, all of which are profitable units; and an automobile business which should be operated independently of the farm implement unit.

Recognition of Mexico Expected to Stimulate Buying Through Extending Credit Relations

AN INTERVIEW WITH H. B. PHIPPS,
Export Manager for the Hudson Motor Car Co.

By D. M. McDonald,
Detroit News Representative of the Class Journal Co.

Detroit, Sept. 12.

ONE of the major difficulties in extending the export market for automobiles is in developing the wholesale viewpoint in the minds of representative companies in the different countries, according to H. B. Phipps, export manager for the Hudson Motor Car Co.

Mr. Phipps expressed this view in commenting upon the possibilities of the Mexican market as opened by formal recognition of Mexico by the United States. Mexico has no distributing organization, as it is known in the United States, and there are few if any countries that have. Firms handling lines of cars seek to do all their business at retail and make little if any effort to develop the wholesale end.

Failure on the part of foreign representatives to grasp the possibilities of the wholesale market and to develop dealer organizations is one of the most difficult situations export managers have to face. With the thought once impressed and the work of distribution properly started, export sales would show large increases, Mr. Phipps declared.

Recognition of Mexico will stimulate car buying principally by the opening up of extended credit relations between bankers of the two countries, Mr. Phipps said. Mexico always has been a good buyer of automobiles, even in the dark days of 1921, he said, when with Honolulu it was practically the only point from which export orders were being received.

Mr. Phipps viewed the general export situation as one holding forth a great deal of promise for car manufacturers. With the exception of the central European countries, he considered practically all points as at least safely past the turning period following the war and on the way back to renewed trade. With Germany stabilized and enabled to get back in production world trade would get its greatest stimulus. India he regarded as in the poorest condition of the big markets, aside from Central Europe, this because of the overstocking of the country previous to the depression.

The temporary loss of the Japanese market, following the earthquake, will have little effect upon the total volume of exports, Mr. Phipps said. Because of road conditions and inadequate bridges Japan has never been a heavy buyer of cars, he said, although in the recent past business has been showing gains.

Mr. Phipps did not regard new models as having a stimulating effect upon export business, but rather creating the opposite condition of causing somewhat of a hold-up in orders while the new cars were being tried out. Export companies have not reached the point where they regard new models as essentially improvements on the preceding ones. As a consequence, trial orders are placed before definite commitments are made for large shipments.

Open cars will continue to be the big factors in export business indefinitely, Mr. Phipps said. This for the most part is a matter of climate, and as most of the countries to which cars are shipped have better climatic conditions than the United States it is natural they should desire open cars. Furthermore, the automobile is not the business vehicle abroad that it is in the United States and is not required in poor weather.

Viewing the export situation broadly, Mr. Phipps said that there is every reason to believe there will be increased business in 1924. Manufacturers cannot press their representatives but on the other hand, if they will work with them and help them, he said, they should find results satisfactory.

These properties also include several important units which do not integrate well with the implement line and which have been a heavy burden on its operating figure.

It was decided to segregate the automobile business and operate it by a new and independent corporation capitalized at \$2,000,000. It was also decided to dispose of the non-integrating properties, throwing the avails of such disposition into the working capital of the implement unit.

While its organization will be less pretentious, the working capital will be ample and under the Moline plan of distribution, its expenses will be cut almost in half with no impairment of its efficiency. The Stephens automobile company will be set up on an

unusually sound basis with ample working capital and an economical organization.

Midland Motor Plant Sold

EAST MOLINE, ILL., Sept. 10—The eight and a quarter acre tract in East Moline, known as the Midland Motor Co. plant, has been purchased from the Moline Plow Co. by Louis Livingston and leased to the Daniel Boone Woolen Mills Co. for factory purposes.

The factory was erected in 1906 by the Deere-Clark Motor Co., but two years later was sold to the Midland Motor,

(Continued on page 557)

Deemster May Place Factory in Detroit

Due to Change in Plans, Production Will Not Be Started Until March of 1924

NEW YORK, Sept. 10—The Deemster Corp. of America, organized a few months ago to build the English Deemster car in this country, may locate its plant in Detroit instead of Hazleton, Pa., as originally intended. Propositions from two or three Detroit concerns have been received by President Julius Keller, Jr., which are being given consideration at the present time.

George F. Summers of England, who was vice-president of the American company when it was first organized has retired from the American concern and the latter's plans have been changed materially. Because of the Detroit propositions, Keller has postponed production and instead of bringing out the first of the American Deemsters in December, it is expected that the first ones will come out in March. Following their introduction, production will be pushed and it is expected that in the first year 6000 cars will be manufactured.

It was planned to ship all of these abroad to meet the European demand, but now it is announced that 40 per cent of the first year's production will be sold in this country, the remainder going to fill English and Continental demands.

The Deemster, long a popular low priced lightweight English car, will be built to sell under \$1000 in this country. It will carry a four-cylinder engine, rated at 12 hp. but said to develop 50 h.p. at maximum speed.

A mechanical feature will be a three-ball-bearing crankshaft and the weight of the car will be about 1250 pounds. Great economy in fuel consumption is claimed.

Private Bid Is Likely to Get Mitchell Plant

MILWAUKEE, Sept. 10—The strong intimation that an acceptable private bid is imminent in the affairs of the Mitchell Motors Co. of Racine, Wis., but the prospective buyers require a little more time to complete arrangements, is found in the formal announcement made by Herbert F. Johnson, trustee in bankruptcy, that the public sale, scheduled for Wednesday, Sept. 12, has been postponed to a date which will be presently announced.

Some time ago it was announced that private bids would be received until Sept. 1, and if no acceptable bid was received, the entire property would be offered at public auction on Sept. 12.

Johnson maintains absolute reticence concerning the matter, but there is a strong belief current that prominent interests have finally come to an agreement to take over the property and save

MAKES BALLOON TIRES STANDARD EQUIPMENT

INDIANAPOLIS, IND., Sept. 11—Balloon tires with necessary wheel equipment are now obtainable on all Cole current Master models. These tires are standard equipment on the Cole-Aero Volante and optional equipment on all other Cole models.

The tires used are Firestones. The diameter is 7½ in. and a pressure of 25 lb. is carried. The standard Cole tire is 5 in. in diameter and the design of the car admits of the larger section tires without any engineering changes.

the industry for Racine. It is also known that representatives of as many as six of the leading passenger car builders of the country have been in Racine for the last four weeks to inspect the plant and make a personal survey of the employment situation.

The prospects for a private bid are such that the public sale has now been officially ordered postponed.

Gillette Uses Laursen Process in Manufacture

EAU CLAIRE, WIS., Sept. 10—The Gillette Rubber Co. is now using the new Laursen hydraulic process of manufacturing casings and tubes exclusively in production. The process has been in partial use for more than a year and experiments cover a period of over two years. Not only a great saving in manufacturing cost, but extension of the life of the product is claimed for the process.

The Gillette company has just booked the largest single order in its history, and it is being executed with the new process. It calls for 150,000 casings and the order is valued at nearly \$2,000,000. The order will enable the company to continue to operate at or in excess of 80 per cent, the average of the past six to eight months, throughout the fall and winter months, even if no other new business were received.

Springfield Malleable Now Branch of Arcade

SPRINGFIELD, MASS., Sept. 11—The Springfield Malleable Iron Co., formed here to take over and operate the foundry of the Harley Co. last spring, has been merged with the Arcade Malleable Iron Co. of Worcester, Mass., and will be operated as a branch of the latter, the two concerns having been under the same control.

It is proposed to issue \$550,000 in first mortgage bonds, \$500,000 in 8 per cent cumulative preferred stock and 10,000 shares of no par value common stock. Plans for increased production are said to be on the program.

Overland Marketing \$10,000,000 in Bonds

Called "Safety Financing"—National City Co. of New York Tenders Offering

NEW YORK, Sept. 11—To increase its working capital, the Willys-Overland Co. has obtained a loan in New York and today the National City Co. is offering \$10,000,000 of Willys-Overland first (closed) mortgage 6½ per cent sinking fund gold bonds for the account of the Toledo concern.

This move is regarded as "safety financing"; that is, it is not absolutely necessary but desirable in order to give the company a large supply of cash or liquid assets. A significant fact is that the banks handling this latest deal are not those with which John N. Willys had such a fight to retain control of his own company.

As offered, the bonds bear 6½ per cent interest and mature on Sept. 1, 1933. A sinking fund is provided at the rate of \$1,000,000 a year and the bonds are redeemable in whole or part at 103 to Sept. 1, 1926; at whole or part at 102 to 1929, at 101 to 1932, and thereafter, but prior to maturity, at 100½. The issue is secured by a first closed mortgage on the company's property and further by pledge of all stocks owned by the principal subsidiary companies. The company has no funded indebtedness—prior to the current offering—and its assets are given as \$30,226,655, of which \$12,526,218 is cash.

Reference to Cash Dividends

It is stated that the company will not declare or pay any cash dividends upon its preferred and common stocks, except out of earnings subsequent to Sept. 1, 1923, and unless after the payment of such dividends current assets shall at least equal 200 per cent of current liabilities, and net current assets shall at least equal 200 per cent of the outstanding bonds.

Upon completion of the present financing net tangible assets will be more than five and one-half times the amount of this issue of bonds. Current assets will be in excess of three and one-half times current liabilities and net current assets alone will exceed three times the amount of these new bonds.

The bonds will be sold by the National City Co. of New York, which will serve with the Ohio Savings Bank and Trust Co. as trustees. They will be offered at 98, and will yield approximately 6½ per cent.

Balloon Tire Equipment Provided for All Moons

ST. LOUIS, Sept. 12—The Moon Motor Car Co. has announced that all its models may be ordered completely equipped with balloon tires. This is effective immediately.

Stevens-Duryea Sale Urged by Receivers

Alternative Proposed in Report Is to Close Plant and Pre- pare for Liquidation

SPRINGFIELD, MASS., Sept. 11—In a report of Harry G. Fisk and Frank H. Shaw, receivers for Stevens-Duryea, Inc., filed in Superior Court here, the closing of the plant and preparation for liquidation are recommended unless a sale of the property can be made in the immediate future.

Continued operation by the receivers, they explain, will necessitate borrowing a considerable amount. The report says:

Estimate of Assets Too High

As of May 10, 1922, and excluding cash and receivables, the assets in our hands as valued upon the Stevens-Duryea, Inc., books aggregated \$3,983,212. Your receivers placed a fair value "as a going concern" upon the same of \$1,243,262; and as a value under forced liquidation, \$337,080.

Subsequent to July 1, 1922, the time above-mentioned values were placed, your receivers had an opportunity to make a complete investigation of affairs and found that the value of assets as carried upon the company's books did not correctly represent the cost, there having been added in the way of writeups as shown by the surplus account, \$1,087,363.

The correct book value should have been, therefore, in round numbers, \$2,900,000. The fair "as a going concern" placed upon the assets by the receivers was proportionately high and after operating the plant for one year—and especially during the winter season—the receivers have realized that the valuation placed by them under forced liquidation was at least \$90,000 higher than it should have been, and were they to place a forced liquidation value upon the land and buildings today it would not be to exceed \$100,000; on tools, jigs, dies and fixtures, practically the scrap value, possibly \$1,000; on service parts or finished parts perhaps \$2,500."

Improvements in Car Possible

The report further states: "It was assumed by the receivers that the Stevens-Duryea car, as then produced, was a finished and satisfactory article. Experience proved, however, that a considerable amount of engineering work was necessary, and that at least four very important units in the makeup of the car could be bought complete, more perfect from an engineering standpoint and better suited for the purpose for which they were to be used, and for an equal cost, after crediting the scrap, and resulting in a far more salable car."

It is stated that the company prior to the receivership produced and sold 152 cars, and, since then, there have been sold 116 new cars and 92 reconditioned and used cars. The report tells of economies by the receivers in reduction of the number of employees and otherwise, and says the receivers saved \$100,000 in salaries by managing the business personally.

NAVY-WRIGHT BIPLANE TRAVELS 238 M.P.H.

NEW YORK, Sept. 11—In an official test at a builders' trial the new Navy-Wright biplane, piloted by Lieut. L. H. Sanderson, broke the official world's speed record over a measured course at Roosevelt Field today, attaining a speed of 238 m.p.h.

This beats the 236.587 m.p.h. made last spring at Dayton, Ohio, by Lieutenant Russell L. Maughan in a Curtiss army pursuit plane.

The Navy-Wright plane is a single-seater, with the radiator an integral part of the wing construction. A metal propeller also is used. The wing span is 22½ ft. and the length 21 ft. 4 in. Total weight is 2900 lb.

A statement of assets and liabilities follow:

Assets as per statement of assets, \$469,734; cash on hand and in banks, \$17,537; accounts and notes receivable, \$9,050. Total assets, \$516,322.

Liabilities: Accounts payable and commitments, \$18,410; assets taken over from Stevens-Duryea, Inc., May 9, 1922, \$387,003; net gain from operation, \$110,908. Total liabilities, \$516,322.

The continued hearing on the proposal to sell the plant for \$450,000 is set for Sept. 15 in Superior Court here.

Wenstone Exceeds Output of Company It Succeeded

CHIPPEWA FALLS, WIS., Sept. 10—The Wenstone Rubber Products Co. of Chicago, which some time ago took over the plant built and for a time operated by the Boone Tire & Rubber Co. at Chippewa Falls, Wis., on Sept. 1 exceeded the best day's output record of the Boone operation by eight tires.

The Wenstone company has \$150,000 worth of orders on its books and new business is developing at a rate that portends a schedule of 20 hours a day before spring, according to J. L. Walton, general manager.

Output of Plate Glass Will Exceed 1922 Total

NEW YORK, Sept. 10—For the first six months of 1923 production of plate glass in the United States amounted to 43,962,855 sq. ft., according to a statement issued by P. A. Hughes, secretary of the Plate Glass Manufacturers of America.

Hughes estimates that the year's production will be about 90,000,000 sq. ft., or almost double the annual production of two or three years ago. In 1921 it was 53,578,672 and for the first half of 1922, 36,781,805. During the last half of 1922, 39,896,402 sq. ft. were manufactured, making a total of 76,678,207 for the year.

Columbia Purchases Liberty Motor Plant

Sale of All Assets Brings \$625,- 000—Manufacture of Both Cars to Be Continued

DETROIT, Sept. 10—The plant and property, both real and personal, of the Liberty Motor Car Co. has been sold to George J. Martin and Theodore A. Barthel, trustees, for \$625,000, subject to the confirmation of the court. The bidders represent the Columbia Motors Co., along with a group of creditors with claims totaling approximately \$1,000,000.

The Columbia Motors Co. will occupy the plant and will continue both the Liberty and Columbia lines. J. G. Bayerline, president of the Columbia Motors Co., states that a large part of the Liberty dealer organization will be retained, thereby increasing the Columbia sales organization and materially widening the distribution of both the Columbia and Liberty models.

The property was sold free and clear, with the exception of an \$87,000 land contract.

Oakland and Oldsmobile Finish Plant Additions

DETROIT, Sept. 10—Two General Motors units, Oldsmobile and Oakland, have completed factory expansions, in preparation for new models, without disturbing production operations.

At Lansing the Olds Motor Works moved its engine plant a distance of several hundred yards, changed the axle plant and shifted other departments to make room for new enameling ovens and a progressive chain assembly system for the making of engines.

In connection with this expansion movement, the company added 500 new machines to the engine plant alone and 250 more to the axle plant. Other sections of the factory also were changed in order that better paint shop facilities are available. This expansion means the adding of more than 1000 employees to the payroll.

Factory alterations at Pontiac have resulted in practically rebuilding the entire interior of the Oakland plant. Installations of new systems and new machinery have been made which have involved the outlay of approximately \$2,000,000.

C. G. TO SELL NOTE ISSUE

DETROIT, Sept. 11—Arrangements have been made by C. G. Spring Co. to sell a substantial note issue to bankers and to place privately a small additional amount of capital stock. All accumulated preferred dividends have been ordered paid. The financial program when completed will give the company ample working capital to handle expansion of its business.

1924 Columbia Line Has New Body Types

Is Featured by Many Detail Refinements—Mechanical Units Remain Unchanged

DETROIT, Sept. 11—Numerous detail refinements rather than outstanding changes are found in the new Columbia line. The same mechanical units and characteristic body lines have been continued, although the line has been enlarged by the addition of new body types.

Bodies have been reinforced by the use of heavier sills and heavier joints. Deeper seat springs and more comfortable upholstery lines are now installed throughout the entire line. The Continental 6-Y engine with improved manifolding is continued, while the rear brake drums have been increased from 12 to 14 in. diameter.

Option of two color schemes is offered by the new Hollywood models, which include a five-passenger open model, a coupe and a five-passenger sedan. In the open models a combination of Chester Hunt red finish with polished black patent leather upholstery or a horizon blue paint with dark blue Spanish leather upholstery is optional. The same choice of colors is available in the closed models, but both are upholstered in gray cloth. The open models are equipped with permanent tailored tops.

Nine Body Styles Provided

Nine body styles are now included in the complete line. The standard phaeton sells at \$985. The former special touring is now included as the phaeton at \$995 with a baked enamel finish.

The Hollywood open five-passenger cars having two optional schemes are priced at \$1,195. The special sport model lists at \$1,195 and the standard sport model at \$1,495, including complete accessory equipment, special top and nickel trimming. The Hollywood coupe model in either of the two color schemes sells at \$1,395 and the standard dark blue finish sedan sells at \$1,495. The Hollywood sedans are priced at \$1,650 without any extra equipment.

The elite sedan, which is equipped with a Continental 7-R engine and complete accessory equipment, lists at \$1,995.

Auburn Will Be Built With Seven Body Types

AUBURN, IND., Sept. 11—The 1924 Auburn cars which were announced a few weeks ago at prices considerably below the 1923 level are being put out in seven body types. The big 6-63 is being made in phaeton, sport and sedan. The smaller 6-43 is to be had in the phaeton, sport, touring, coupe and sedan.

The mechanical changes are of a minor nature and the comforts of driver and passengers account for a good many refinements in the bodies. The wheelbase

of the 6-63 is 2 in. longer, bringing it to 124 in. The body is by McFarlan and aluminum panels have been used to reduce the weight and improve the finish. Windows are wider and the doors have been fitted with a chain action check which fits into the body when the door is closed. The 6-43 model has an added feature in the operation of the windshield wing. When folded back this wing fits flush with the windshield and door and swings with the door. The curtains are carried to the wing and fastened to it. This gives a greater range of vision when the curtains are in place.

A new sedan is to be put on the 6-43 chassis. It carries five passengers and is fitted with Clement window lifters. The top is of the soft roof type.

\$450 to \$550 Price Cuts Made on Models of R & V

EAST MOLINE, Sept. 10—Effective today, the R & V Motor Co. has made price reductions on its six cylinder model H chassis, ranging from \$450 to \$550. A new five-passenger closed model known as the "Club Sedan" has been introduced and lists at \$3,050.

No changes have been made in either the chassis or body designs, so that the models for 1924 will be identical with the 1923 cars.

The following schedules show the old and new prices:

	Old Price	New Price
5-passenger phaeton.....	\$2,850	\$2,300
4-passenger sportster.....	2,850	2,400
7-passenger phaeton.....	2,900	2,375
5-passenger coupe.....	3,500	3,000
5-passenger club sedan....	....	3,050
7-passenger sedan.....	3,700	3,250

Apperson Lowers Prices on Eight-Cylinder Cars

KOKOMO, IND., Sept. 12—Prices of its eight-cylinder models will be reduced \$315 to \$465 on Sept. 17, it was announced today by the Apperson Bros. Automobile Co. The five and seven-passenger phaetons will list at \$2,485 and both sedan models at \$3,385. Other than a few chassis and body refinements there will be no change in the 1924 cars.

No announcement has been made regarding the six-cylinder line.

The following shows the old and new prices.

	Old Price	New Price
5-passenger phaeton....	\$2,800	\$2,485
7-passenger phaeton....	2,900	2,485
5-passenger sedan.....	3,750	3,385
7-passenger sedan.....	3,850	3,385

New 5-Passenger Sedan Added to Willys-Knight

TOLEDO, Sept. 12—A new five-passenger sedan has been added to the Willys-Knight line. It will be offered in two types, one known as the standard, listing at \$1,795, and the other, a de luxe edition, which will sell for \$100 more. No chassis changes have been made.

Cadillac Announces Prices of New Line

Phaeton Lists at \$2,985—Factory Is Reported to Be Operating at Capacity

DETROIT, Sept. 12—The Cadillac Motor Car Co. made formal announcement of its new models today, the announcement being made in daily newspapers with emphasis on the new engine design, new body styles and four-wheel brakes.

Showings will be made in all cities of the country, the new cars having been in shipment to dealers since the middle of August.

The prices on the new line are as follows:

Touring, phaeton and roadster....	\$2,985
2-passenger coupe	3,875
5-passenger coupe	3,950
Sedan	4,150
Suburban	4,250
Imperial sedan	4,400
Imperial suburban	4,500
Standard limousine	4,600
Town brougham	4,600

The price of the touring, phaeton and roadster of the previous model was \$2,885; of the sedan, \$3,950 and of the limousine, \$4,300.

President H. H. Rice said the factory was now at capacity on the new models. Shipments have been going forward as high as 120 cars daily. The new cars are in the hands of Cadillac dealers in all cities of the country, Rice said, and deliveries will be made, dating from today.

The company's attitude on business prospects is reflected in its production totals, Rice said. General business has shown steady improvement, and today the outlook is such as to indicate good automobile business through the rest of the year.

Hupp Aims to Produce 4400 Cars This Month

DETROIT, Sept. 12—September production of the Hupp Motor Car Corp. has been set at 4400 cars, with the factory operating six full days a week and an hour overtime each day. On the basis of operations as outlined by the volume of business developing from the new models, the company expects to pass its last year's production total by Nov. 1. The mark of 40,000, set for this year, will be exceeded according to the factory's ability to produce.

Orders placed by distributors and dealers for the balance of the year require the speeding up of production to its fullest degree, O. C. Hutchinson, sales manager, says.

Additions to the company's body plant at Racine have made possible an extensive addition to its closed body supply, and the company will be in a much better position to meet closed body business than last year.

Spark Plugs Exempt from 5 Per Cent Tax

Treasury Department, in Ruling,
Regards Them as Commercial
Commodities

WASHINGTON, Sept. 10—Under a decision of the Treasury Department spark plugs are held to be commercial commodities and not subject to the excise tax imposed on automobiles and parts. The tax has been 5 per cent.

The ruling states that exemption is granted "where it is clearly shown that the articles in question are not specially designed nor primarily adaptable only for use on or in connection with automobiles, but are interchangeable and extensively used in many other industries."

In defining its reasons for exempting spark plugs from the excise taxes, the Treasury Department stated as follows:

It is a well-known fact that spark plugs were in use for many years before automobiles came into existence. It is also common knowledge that they are used on all kinds of internal-combustion engines, both stationary and portable. It is stated that all the drawings and illustrations in the files of the Patent Office show the use of spark plugs in stationary engines.

Spark plugs are made in a few standard sizes, and all engines in which they are to be used are designed for the standard size plugs. There is no question but that the same spark plugs are interchangeable in both stationary and portable engines. While they are used very extensively in automobiles, the same plugs are used in motor boats, airplanes, farm tractors, road graders, railway locomotive engines, threshing engines, concrete mixers, water pumps, hoisting machines, and for innumerable other purposes.

Larger Louisville Plant Will Be Erected by Ford

LOUISVILLE, KY., Sept. 10—A new assembly plant of the Ford Motor Co., which will be as large as any Ford plant in the South and may be enlarged in time to be the main assembly plant south of the Ohio River, is assured for Louisville, it was announced yesterday by Edwin L. McPhee, manager of the Louisville branch.

Negotiations for the purchase of twenty-two acres with a river frontage of 650 ft., located on Western Parkway between the United States Fisheries Station and the Dixie Fuel Co., are almost completed. The deal will be closed as soon as it has been ratified by the Detroit office. It is expected that all plants will be finished, and work on the new factory will be started before the first of the year.

The present plant of the company comprising two and one-third acres at Third and K Streets will be offered for sale today.

While no definite plans for the new plant have been announced, it is believed that the cost will exceed \$1,000,000. The company will pay \$33,000

for the site. On account of the river frontage, it is likely that docks will be built and river transportation developed. Plenty of trackage will be provided to take care of rail shipments.

The output of the present plant is 200 automobiles daily. According to McPhee, at least 100 more cars a day will be produced, and the force of 500 men will be augmented by 400.

More Fees Will Be Paid in Willys Receivership

TOLEDO, Sept. 12—Fees amounting to about \$150,000 to receivers and attorneys interested in the Willys Corp. receivership were allowed yesterday by Judge Killits in the Federal Court here.

Tracy, Chapman & Welles, solicitors for the plaintiff, the Ohio Savings Bank & Trust Co., and for the receivers were granted \$53,243, of which \$50,000 was fee and the remainder expenses and may be granted additional fee for their work in connection with the sale of the big block of Overland stock.

Rathbun Fuller, solicitor for the receivers; E. J. Marshall, solicitor for the receivers and counsel for the bank creditors' committee, and Frank P. Kennison, receiver, were each granted \$25,000.

Francis G. Caffey, receiver, was given \$12,000; Curtis T. Johnson, special master, \$5,000, and Forrest Jeffries, solicitor for the defendant, was allowed \$2,500.

This was the second distribution of fees.

W. T. Sampson Is Head of Industries in Canada

TORONTO, Sept. 11—W. T. Sampson of the Ontario Steel Products Co., Ltd., of Cananoke, was reelected president of the Automotive Industries of Canada at the annual meeting of the organization. T. A. Russell, president of Willys-Overland, Ltd., was chosen vice-president, and W. G. Robertson, secretary and treasurer.

Elections to the board of directors were as follows:—W. R. Campbell, Ford Motor Co. of Canada, Ltd., Ford, Ont.; C. H. Carlisle, Goodyear Tire & Rubber Co. of Canada, Ltd., Toronto; W. A. Eden, Dominion Rubber System, Ltd., Montreal; Robert Gray, Gray-Dort Motors, Ltd., Chatham; R. S. McLaughlin, General Motors of Canada, Ltd., Oshawa; W. A. Rowland, Steel Co. of Canada, Ltd., Toronto; J. A. Taylor, Taylor-Forbes Co., Ltd., Guelph, and the officers.

The association is made up of the car, tire, truck equipment and parts makers of the Dominion and is analogous to the National Automobile Chamber of Commerce in the United States.

MERGER RUMORS DENIED

SPRINGFIELD, MASS., Sept. 11—Rumors circulated in New York that plans for a merger of the American Bosch Magneto Co. and Gray & Davis, Inc., are positively denied by Morris Metcalf, treasurer of the American Bosch company.

Studebaker Factory Supervises Services

Policy in Large Cities Will En-
able Dealers to Center Atten-
tion on Sales

DETROIT, Sept. 10—Studebaker Corp. of America is establishing several new service stations in Detroit as branches of the present factory service station, in order to meet the demand for service arising from the increasing number of Studebaker owners in the city. The new stations are being added after a survey of service conditions in the city by H. B. Harper, general sales manager of the corporation.

Under the Studebaker service system in this city, the sales branch and the group of resident dealers are relieved of all service obligations, this being all under factory supervision and administration. The company's service policy as to charges is to assess these on a basis that will make the service branches and sales branch self-sustaining, thus keeping the expense to the owner at a minimum.

This policy, it is understood, will be carried out in all large cities in which the company has a sales branch and group of resident dealers. By consolidating the service under factory supervision, the sales branch and dealers are in a position to devote exclusive attention to sales. It has the additional advantage of bringing all service work to one point where facilities and equipment may be maintained, thus increasing economy and facility in handling the work.

Coats Steam Creditors Will Meet September 20

COLUMBUS, OHIO, Sept. 12—John G. Price, receiver for the Coats Steam Car Co., announces that a meeting of the creditors of the company is scheduled for Columbus Sept. 20 when a number of legal matters will be threshed out.

An inventory of the property of the concern shows real estate of \$278,000 and material and machinery valued at \$20,000. No disposition has been made of the \$9,000 which was advanced by agents and which is held by a Columbus bank, awaiting court decision as to its disposition. So far no offer has been received to take over the plant for manufacturing purposes.

16,000 Cars Produced by Buick Last Month

DETROIT, Sept. 12—Buick Motor Co. production in August approximated 16,000, a gain of 4500 over the production of August last year. A new daily record for shipments was set on Aug. 31 with 972.

Sales of the new models are reported by E. T. Strong, sales manager, to be coming through in large volume.

A. H. Whiting Dead; Helped Start S. A. E.

Was First Treasurer of Society
of Automobile Engineers
Formed in 1905

NEW YORK, Sept. 10—Allen H. Whiting, one of the founders of the Society of Automobile Engineers, now known as the Society of Automotive Engineers, and its first treasurer, is dead by his own hand, as a result of despondency over business reverses.

In the passing of Mr. Whiting the industry loses a man who has been identified with it since its earliest days in both an engineering and merchandising way and whose faith in the future of the automobile was well demonstrated in the pioneer days. A brother-in-law of A. L. Riker, at one time head of the Locomobile Co. of America, he rode with Riker when the latter, driving an electric, set up a mile record on Long Island roads, which startled the automobile world twenty-five years ago.

Attended Initial Meeting

When H. M. Swetland conceived the idea of forming a national organization made up of automobile engineers and issued a call for a meeting in January, 1905, there were only two other men sufficiently interested to attend the first meeting, which was held during the New York show—Allen H. Whiting and E. T. Birdsall.

The three engineering enthusiasts, however, were not daunted by the small turnout, but went ahead with their plans for the organization of the Society of Automobile Engineers, electing Andrew L. Riker as its first president, Mr. Whiting was chosen treasurer and Birdsall secretary. It was from this small beginning that the S. A. E. sprang and it was the faith of its founders that made its organization possible.

Referee of Glidden Tour

Mr. Whiting also took an active interest in the sporting side of motoring and served as referee of the 1910 Glidden tour, which was the greatest of those famous classics, marking as it did the last of general participation by automobile manufacturers. This was the tour that started from Cincinnati, went through the South, turned North in Texas and finished in Chicago. It was a strictly stock-car contest and the awarding of the trophy to the Premier was followed by a protest. It was claimed the Premier was not stock in that an auxiliary oiler mentioned in the entry had not been fitted to a sufficient number of Premier cars to make the Premier that contested in the Glidden a stock car according to A. A. A. rules.

Called upon to act, Referee Whiting upheld the protest of the Chalmers company, whereupon Premier appealed to the Contest Board of the A. A. A. which backed up the referee. So bitter was

the fight over the trophy that the Premier company carried it into the courts which upheld both Referee Whiting and the Contest Board, holding that sport-governing bodies must be supreme in matters under their jurisdiction. The trophy therefore was awarded to the Chalmers company.

In the business world Mr. Whiting was president of the Whiting Motor Co., 161 West Sixty-fourth Street, New York City. In the early days he handled the Stoddard-Dayton and for years was Metropolitan representative of the Mercer.

General Motors Official, J. Amory Haskell, Dies

NEW YORK, Sept. 10—J. Amory Haskell, vice-president and member of the executive committee of the General Motors Corp. and vice-president of E. I. duPont de Nemours & Co., died yesterday at his country home, Oak Hill Farm, Red Bank, N. J., aged sixty-two.

Mr. Haskell had been in ill health for the last two years, but had maintained his General Motors activities to the end. Formerly he was president of two of the General Motors subsidiaries, the export and acceptance corporation, but about a year ago he resigned these positions to devote himself to the parent company.

Stockholders Approve Oneida Truck Purchase

GREEN BAY, WIS., Sept. 10—Acquisition of the Oneida Motor Truck Co. of Green Bay, Wis., by a new \$500,000 Wisconsin corporation, styled the Oneida Manufacturing Co., has been accomplished with the consent of approximately 95 per cent of all stockholders. The new company will take possession immediately.

Besides building the Oneida truck, it will manufacture gasoline railway coaches and cars and a line of wood and metal specialties. L. W. Melcher, who has been manager of the Oneida company for the past year, is at the head of the new corporation, which has been adequately financed.

In addition, the conditions of the purchase by the new company are that over \$500,000 of mortgage bonds against the original company will be cancelled, and bondholders will accept stock in the new corporation at from 50 to 85 per cent of the face value of their bond holdings, depending upon the classification of the issue. The new company assumed liability for all outstanding obligations.

CONCENTRATING ON RADIATORS

DETROIT, Sept. 10—The National Can Corp. has sold its tin can and collapsible tube business to the Continental Can Co. of New York. The operation of these departments will be under the direction of Arthur V. Crary, formerly of the National Can Co. The sale was made in order that National might be able to extend the manufacturing facilities of its radiator department.

Fiat Wins European Grand Prix at Milan

Takes Both First and Second
Place—Murphy, in Miller
Special, Is Third

ROME, Sept. 9—(by cable)—Denied a victory in the French Grand Prix when its chances seemed best of the brilliant field in that classic, Fiat today more than evened the score by running one and two in the European Grand Prix over the Monza Speedway at Milan. Jimmy Murphy, American champion, in a Miller Special, was third.

The winning Fiat was driven by Salamano, who led the French Grand Prix most of the way, being forced out by the exhaustion of his gasoline supply. In today's race Salamano covered the 497 miles in 5 hours 27 minutes 38 seconds, an average of 91 m.p.h., which is just a shade slower than the 92.44 m.p.h. made by Tommy Milton in an H. C. S. Special when he won the 500 mile race at Indianapolis last May. Both the Monza and Indianapolis races were for cars of 122 cu. in. piston displacement. Salamano's fastest lap today was 99 m.p.h.

Nazzaro Arrives Second

Second to Salamano was his team mate, Nazzaro, long one of Europe's greatest drivers and competitor in several American road races. He covered the distance in 5 hours 28 minutes 2 seconds. Murphy's time was 5 hours 32 minutes 51 seconds.

Premier Mussolini officiated as starter, sending away a field of fourteen cars, with 250,000 people in attendance. Bordino, the third Fiat pilot, led the way for forty-eight laps and apparently had the speed of the party. Unfortunately for him, though, the severe accident which he suffered in training ten days ago was reflected in his physical condition and he was forced to quit.

This left the battle to Salamano, Nazzaro and Murphy, the two Italians apparently holding Murphy safe in the matter of speed. Their Fiats were faster than the Miller, Murphy being handicapped by an unsuitable gear ratio.

Of the remaining cars in the race, Minoia in a Benz covered seventy-six out of the eighty laps; Horner, Benz, seventy-one, and Alzaga in an American Miller, seventy.

Only One Stop for Murphy

Murphy made only one stop and that to change a tire. The entire Voisin team went out because of mechanical troubles. De la Landre, in a Rolland-Pilain, broke a roller bearing in his engine. Guyot, also Rolland-Pilain, burned a leg, while Count Zbrowski had engine trouble. Walb, in a Rumpler Benz, had engine trouble. The Alfa Romeo entry was withdrawn for the reason that Sivocci was killed in practice the day before the race.—W. F. Bradley.

Show Space Drawing Is Set for Armory

Will Not Take Place in N. A. C.
C. Headquarters—Directors
Discuss Plans

NEW YORK, Sept. 10—Directors of the National Automobile Chamber of Commerce at their September monthly meeting discussed show prospects and because of the reports submitted by General Manager S. A. Miles were thoroughly enthusiastic over the New York outlook.

Decoration plans were gone over and the directors were informed that the New York affair will be the greatest industrial exhibition ever held under one roof.

In order that the industry as a whole may get an idea of the immensity of the Eighth Coast Artillery Armory, located in the Bronx, it was decided by the directors to hold the annual drawing for space in the Armory itself instead of at the headquarters of the N. A. C. C. This meeting is the one open to all members and will bring together representatives of every concern in the Chamber. It will be held next month as usual.

In line with the show preparations, Alfred Reeves, general manager of the N. A. C. C., will address the Bronx Rotary Club next week, when he will tell the business men of the borough in which the show will be held, something of the magnitude of the proposition.

N. A. C. C. directors also appointed C. D. Hastings, president of the Hupp Motor Car Co., a director of the Chamber to fill the vacancy caused by the resignation of J. Walter Drake, now assistant secretary of the Department of Commerce at Washington.

Report on Trade Conditions

Trade condition reports from leading men in the retail trade read at the meeting declare that fall prospects are generally better than last year.

August car sales, the retailers reported, were about the same as July or better, in Georgia, Illinois, Michigan, Nebraska, Washington, Wyoming and North Dakota, but generally less in the country as a whole. Compared with last year, sales showed an improvement. Truck business was smaller than the preceding month but same as a year ago if not better.

As a whole the sales of used cars were fair and in Boston, Portland, Saginaw, Omaha, Fargo and Sioux Falls the used car demand was better than in July. Time payments varied from 20 to 90 per cent but most frequently they were reported at from 65 to 70 per cent.

Hear Merchandising Suggestions

The directors also received from their correspondents suggestions for improving merchandising methods. Birmingham, Ala., favored the formation of local dealers associations, fostering coopera-

tion in cutting trade in losses and exchanging business costs. Topeka, Kan., wants better service, especially better conditioning of used cars. Small and poorly financed manufacturers should cease to force the sale of their products regardless of profits or good business methods, this Kansan retailer thinks.

Boston advocated an agreement among dealers to sell cars at full price by the use of legitimate methods. St. Louis declared for persistent hard work by dealers, while Omaha voted for the stabilization of the used car market. Buffalo believes uniform production by manufacturers would help put the sale of cars on a steady level every month in the year, while New York City is strong for cooperation among dealers on trade-in allowances.

Better salesmen and closer cooperation among dealers are points stressed by Cincinnati, while Pittsburgh voted to have all manufacturers announce their new models simultaneously. Seattle declared that factories should cooperate more closely with dealers in replacing defective parts, while Cheyenne went on record as favoring fewer makes of cars and trucks and the elimination of "mavericks."

Finds Fault with System of Gasoline Distribution

SYRACUSE, N. Y., Sept. 11—Thrown into the limelight through his fight for lower gasoline prices, Governor McMaster of South Dakota was the principal speaker at the New York State Fair yesterday, his speech being devoted to the fuel question.

Analyzing the situation, the Governor declared that the whole distribution system at fault. He held that it will have to be reorganized on a business basis in order to effect economies that will be of substantial benefit to the public.

The Governor said:

The present distribution system as established by both the independents and the oil trust, and largely inspired through the lowering of excess profits, is a blunder. In the great majority of the towns and cities of the United States there are 50 per cent more filling stations than are necessary to meet the requirements of the people. For instance, the Kansas City *Star* states that there are 400 filling stations in that city, and that possibly 100 could efficiently meet the needs of Kansas City.

It must be borne in mind that the average filling station, including tax and interest upon the investment, distribution and labor, cannot be maintained for less than \$300 a month. In Kansas City that would represent \$90,000 a month of needless expense which must be borne by the consumers. If Kansas City consumes 3,000,000 gallons a month, \$90,000 represents three cents a gallon needless distribution cost.

DENMARK TARIFF RULING

WASHINGTON, Sept. 11—All automobile and motorcycle tires imported into Denmark must show the country of manufacture, according to a new tariff customs regulation just promulgated by the officials of that country. The new law becomes effective Jan. 1, 1924.

19 Exhibits Entered in Astor Hotel Show

American Cars, With Foreign,
Will Be Placed on Display
November 4 to 10

NEW YORK, Sept. 10—Cars directly from the Paris Salon will be exhibited at the show to be staged by the Foreign Automotive Association, Inc., in the Astor Hotel, this city, Nov. 4 to 10, it is announced by Jan. H. Stelling, managing the exhibition.

Already nineteen exhibitors have been booked for the initial display of the association, of which eleven are foreign-built cars, four American and four body building concerns. Originally it was planned to confine the show to foreign cars, but a change of policy was made whereby a few high-priced American cars will be allowed in.

List of Entries

As the list stands now there are entered the Benz, Fiat, Hotchkiss, Isotta, Lanchester, Mercedes, Minerva, Panhard, Renault, Voison and Steiger of foreign extraction; the Lincoln, Rolls-Royce, Brewster and Locomobile, American-built; and Brewster, Holbrook, Kellner and Rothschild, body builders. The Steiger, a German car, never has been exhibited in this country. It is a \$4,000 car, handled in this country by James Martin of New York City.

The show will be held in the main ballroom and its adjoining rooms.

The Foreign Automotive Association, Inc., was formed several months ago by importers to handle legal questions, custom house formalities and to promote an annual show. Harold P. Baran, Benz, is president; Jan H. Stelling, Voison, vice-president; J. Vinton Locke, Locke & Co., treasurer; Percy A. Peyser, Fiat; Alexander Faure, Panhard; Frederick H. Buell, Brewster; James Martin, Steiger, and Richard Schelling, Mercedes, directors.

Gasoline Stocks Showed 54 Days' Supply August 1

WASHINGTON, Sept. 10—The Bureau of Mines reports that gasoline stocks on Aug. 1 showed a decrease of 98,193,788 gallons of gasoline from the amount held July 1, when a sixty days' supply of gasoline was available.

Estimated at the July rate of consumption gasoline at refineries in this country on Aug. 1 constituted a fifty-four days' supply. These figures, however, show that the stocks on hand exceeded those of Aug. 1 last year, when a forty-two days' supply of gasoline was in storage.

Domestic consumption during July amounted to 674,019,467 gallons, an increase of 40,516,877 gallons over June. Imports in July amounted to 22,634,719 gallons while exports were 83,721,199 gallons.

Men of the Industry and What They Are Doing

Farley Succeeds Kemp

A. P. Kemp has resigned as president of the Auburn Automobile Co. of Auburn, Ind. His successor is J. I. Farley, promoted from vice-president and director of sales. W. C. MacFarlane, acting general manager, has been made assistant treasurer and assistant general manager. Farley has been with the Auburn company fifteen years, starting as a salesman, later becoming sales manager. For a number of years he has been vice-president and director of sales, taking an active part in the management of the company.

Albert Champion Goes Abroad

Albert Champion, president of the A. C. Spark Plug Co. of Flint, Mich., sailed Tuesday for Europe, to be gone two months. During his trip he will visit factories of the company in France and England.

Helm Manages Acme Truck

W. A. Kysor, who has been president and general manager of Acme Motor Truck Co., Cadillac, Mich., since its organization in 1915, has resigned and has been succeeded as general manager by C. J. Helm, who has been secretary and sales manager since 1915. Helm will continue in the office of secretary. Further announcement as to the election of a president and naming of sales manager will be made by the board of directors at a later meeting. Kysor has made no announcement of his plans. He was the leading spirit in the development and organization of the Acme company and designed the line of trucks which are being marketed today.

Changes with Hendee

John D. Stephens, for eleven years connected with the Hendee Manufacturing Co., has resigned as treasurer and has left the concern. Parmly Hanford, secretary, will combine the office of treasurer with the one he already held. John W. Leahy, chief accountant, has been made assistant treasurer.

Riddle to Speak in Paris

F. H. Riddle, director of research for the Champion Porcelain Co. of Detroit, which manufactures all cores used in Champion spark plugs, will sail on the Leviathan, Sept. 29, for Paris to address the International Conference for High Tension Transmission Lines at its meeting there Oct. 8. His subject will be "The Composition, the Microstructure and the Physical Properties of Insulator Porcelain."

Harper Victor Truck Export Head

V. George Harper has been appointed export sales manager for the Victor Motor Truck Co. of St. Louis. He has

traveled extensively in Europe, representing American interests, and it is expected he will be instrumental in forwarding the company's announced policy of seeking foreign markets for its product.

Harris Takes Charge of Sales

G. D. Harris, vice-president and general manager of the Wisconsin Automotive Corp., formerly U. S. Tractor & Machinery Co., Menasha, Wis., has resigned as general manager and will take entire charge of the sales department. Adolph F. Reinecke has accepted the general management and direction of works. The concern recently changed its name and announced that, in addition to manufacturing the U. S. tractor and tractor tools, it will build passenger cars, principally motor buses and large-capacity passenger hauling equipment, including trackless trolley cars, gasoline railway cars and coaches, and gas engine generating units.

Bruno Joins Netherlands Aircraft

H. A. Bruno has resigned his connection with the Aeromarine Airways, Inc., to become associated with the Netherlands Aircraft Manufacturing Co. of New York, which represents the Fokker plane.

Hoffman Heads Elgin Service

Elgin Motors, Inc., has appointed O. A. Hoffman as service manager. Hoffman has had extensive experience in service. For four and a half years he served with the Goodyear Tire & Rubber Co. as special representative on development and service, and for a year and a half acted as service manager of the Duesenberg Automobile & Motors Co.

Lardner in Insurance Work

James F. Lardner, Jr., son of the former manager of the Tri-City Street Railways and of the Rock Island Plow Co., who for four years has been one of the junior executives of the Deere & Co. plant in Moline, Ill., has resigned to enter the insurance field.

Brozek Represents Eco Motors

J. H. Brozek has severed his connection with the Rickenbacker Motor Co. to become direct representative of the Eco Motors Co., Ltd., of Melbourne, Australia. He will have offices and warehouse at 2366 Denton Avenue, Detroit.

Barnes Succeeds Stinson

B. E. Stinson, zone sales manager at Minneapolis, for the Chevrolet Motor Co., has resigned because of ill health and has been succeeded by L. B. Barnes, formerly assistant sales manager at the same office.

All Plans Completed for M. A. M. A. Meeting

Subject Relating to Better Brake Equipment New Addition to Convention Program

NEW YORK, Sept. 12—Plans have been fully completed for the annual fall convention of the Motor and Accessory Manufacturers' Association, which will be held at the Copley-Plaza Hotel, Boston, from Wednesday to Saturday of next week. Acceptances have been received from more than 200 representatives of companies holding membership in the National organization, while many others identified with the industry will be present.

General Manager M. L. Heminway set out to make this convention a congress of the industry and it looks as if he will be successful. Although held under the auspices of the unit and accessory manufacturers, all branches of the trade will be represented. Leading car and truck builders will be on hand and so will engineers, financial executives, authorities on advertising and selling, export managers, traffic chiefs and specialists on good roads.

Roads to Be Discussed

The dominant theme of the convention will be: "Widening the Market for Automotive Products." With this in mind an admirable program has been made up, a feature of which will be a speech on the opening day by Roy D. Chapin, chairman of the board of the Hudson Motor Car Co., on "Building More and Better Roads."

A new subject added to the program is "How Better Brake Equipment Can Sell More Cars," by Dr. F. C. Stanley, chief engineer of the Raybestos Manufacturing Co. of Bridgeport, Conn. This is expected to arouse lively discussion on the timely question of four wheel brakes.

List of Speakers

Other speakers are:

Gerrit Fort, vice-president, Boston & Maine Railroad; Sidney S. Meyers, general counsel, Motor and Accessory Manufacturers' Association; Harry Meixell, secretary, Motor Vehicle Conference Committee; E. P. Chalfant, chairman, Gill Manufacturing Co.; Ray W. Sherman, business counsel, the Class Journal Co.; I. J. Nevin, assistant treasurer, Moto-Meter Co.; O. W. Meyers, district credit manager, Goodyear Tire & Rubber Co.; John F. Kelly, export sales manager, Electric Storage Battery Co.; F. E. Titus, vice-president, International B. F. Goodrich Co.; S. W. Dorman, vice-president, Overseas Motor Service Corp.; W. H. Chandler, traffic manager, Boston Chamber of Commerce, and W. M. Twohig, traffic manager, Willard Storage Battery Co.

Rubber Associations Not to Consolidate

Midwest Decides Against Merger and Votes to Take Steps for More Members

CHICAGO, Sept. 11—The Midwest Rubber Manufacturing Association, at a meeting here today, took a new lease on life. A resolution was adopted to shelve any and all suggestions for the consolidation of the association with any similar association, and it was decided by the board of directors to take aggressive steps to expand the membership. It was also decided to retain the headquarters at Chicago.

Manufacturing members viewed the tire situation as slightly more favorable than it has been for several months. From the Mississippi valley territory came reports that the low price of gasoline now in effect in this section has resulted in a vastly increased use of automobiles with consequent need of more tires. A reaction of tire buyers from the extremely low priced casings also was reported.

Manufacturers in the Midwest group, who have standardized on a quality product at a fair price, declared they have no trouble in disposing of their goods. At least two of these manufacturers asserted that all their sales are now being made for cash with order or C.O.D., and that they are cooperating with jobbers and dealers in the merchandising of the goods.

It was indicated that the association is considering taking a strong stand officially in the near future against the practice of long dating of invoices in the tire trade.

40,979 Cars and Trucks Built by Ford in Week

DETROIT, Sept. 12—The Ford Motor Co. for the week ending Sept. 11 produced 40,979 cars and trucks for the domestic market, an increase of 7514 over the week previous, which was a five-day week, due to the Labor Day holiday. Tractor production was 1786 and Lincoln output 196.

Demands from dealers continue to run well in excess of production capacity, although not as large as in the early months of the year. In the current month dealers have filed orders approximating 225,000.

The factory notes a steady increase in the enrolments under the weekly payment plan and looks for especially large increases in the fall and winter months as the rush for immediate deliveries shows a tendency to subside.

Although the number of persons buying cars on the weekly plan is large, officials declare there would be many more thousands enrolled but that dealers were unable to devote any large extent of time to it owing to the pressure of regular business.

It is planned to make special efforts on enrolments during the fall and winter months to line up a large volume of business for the early part of the year.

PERSONAL NOTES

Crippen Manages Acme Wire Office

J. T. Crippen has been placed in charge of the office which the Acme Wire Co. of New Haven, Conn., is opening in the Kresge Building, Detroit. The company's Cleveland office has been closed and hereafter the Detroit office will look after Cleveland territory.

Andrews Traveling for Wills

Douglas Andrews has been appointed traveling sales representative of Wills Sainte Claire, Inc., working on general assignment from the Marysville offices. Andrews is well known in the industry, having been with Maxwell, Hudson and Liberty.

Smith Doss Sales Manager

D. V. A. Smith, who has been prominently identified with the manufacturing end of the tire industry for some years, has been appointed sales manager of the Doss Rubber & Tube Co., Atlanta, manufacturer of cord tires and inner tubes.

Seelye and Brown Join Agency

Warren O. Seelye and Harold P. Brown, formerly of the firm of Seelye & Brown, Inc., has joined the organization of George Harrison Phelps, effective Sept. 1. Several of the accounts formerly handled by Seelye & Brown will be serviced by the Phelps agency after this date. The firm of Seelye & Brown, Inc., is to be dissolved.

Aveyard in Charge of Agency Office

A. E. Aveyard has been placed in charge of the office which the Campbell-Ewald Co. has opened at 604 Mutual Home Building, Dayton, Ohio. He has been assistant manager at the Chicago branch where his place will be taken by Leslie Hannah, formerly general manager of the Hannah-Crawford agency of Milwaukee.

N. A. D. A. Drafts System for Dealer Accounting

ST. LOUIS, Sept. 12—C. A. Vane, general manager of the National Automobile Dealers' Association, announces that the work of the association in drafting an accounting system into one book for automobile dealers has been completed. Approximately 900 dealers have declared that they were interested in such a publication.

Contained in the book is every item that comes up in the course of a dealer's business and is accompanied by instructions. It is said the system is so simple that a schoolboy could care for the accounts.

Tire Sales in South Hurt by Price Cuts

Buyers Wait Lower Lists—Dealers Would Change Makers' Advertising Policy

ATLANTA, GA., Sept. 12—That the recent price reductions announced by tire manufacturers have had the effect of generally demoralizing conditions throughout the South, and have injured sales materially in this district, is the opinion expressed by several of the larger tire dealers and jobbers of Atlanta. It is stated that the buying public seems so certain that further price reductions are in prospect that they are holding off their tire buying to the very last minute.

The result has been a sudden dropping off in the sales volume which has lasted for some weeks, and in many instances a 20 to 35 per cent falling off in the gross income of larger dealers, of which part is represented by the tire price reductions.

Without exception the larger dealers of Atlanta expressed themselves as strongly opposed to the present policy of manufacturers in advertising price changes, especially in the very middle of the buying season. Invariably, they claim, such practice will have the effect of demoralizing the market.

At the same time the wholesale outlook over the district for tire sales is very good, due to the fact that retail dealers have the smallest stock in hand they have carried in months, and will have to make substantial purchases shortly if they are to continue in business.

Moline Plow to Sell Some of Its Holdings

(Continued from page 549)

which after two years failed. During the war the plant was leased by Deere & Co., which later assigned it to Moline Plow. The latter, in turn, made some trucks there, chiefly for experimental purposes.

Foundry Transferred

MOLINE, ILL., Sept. 8—Property valued at \$200,000 has been formally transferred from the Moline Plow Co. to the Tri-city Malleable Castings Co., according to deeds recorded here this week. The ground is 450 x 600, and is situated in East Moline. The Tri-city Malleable was recently organized to take over the foundry and castings plant and is just beginning production.

GEAR MAKERS TO MEET

CLEVELAND, Sept. 12—The semi-annual meeting of the American Gear Manufacturers Association will be held at the Mountain House, Lake Mohonk, N. Y., Oct. 25-27. A meeting of the executive committee will be held at the Hotel Cleveland, this city, Saturday, Sept. 15.

Ford's Map Details Branch Statistics

Exhibit at Michigan State Fair Shows Foreign and Domestic Business for Year

DETROIT, Sept. 7—As part of its exhibit at the Michigan State Fair, Ford Motor Co. has revised its industrial map of the United States, showing the divisions according to sales territories of its many branches, their annual sales for the year to Sept. 1, the daily capacity of each of its assembly branches and manufacturing plants, and the number of retail sales agencies operated by each branch.

There are twenty-nine assembly branches and five sales branches now in operation in the United States. There are ten foreign assembly branches and nine foreign sales branches. A compilation of the annual sales shows domestic business in Ford cars and trucks to be 1,558,239 for the year to Sept. 1, and foreign business, 126,751.

The Ford exhibit at the fair included all of its products from the rough timber and mineral stages to the finished automotive products and the numerous mineral and chemical by-products. There were also exhibits by the Henry Ford Hospital and Trade School. Aside from the Ford exhibit the automotive section of the State Fair consisted principally of accessories and vehicles, such as trailers, intended for use in conjunction with Ford products.

Retail Sales Statistics

Statistics outlined on the Ford map as relating to retail sales were as follows:

UNITED STATES SALES			
Assembly Branch	Annual Sales	Daily Output	Dealers
Atlanta	45,709	250	244
Buffalo	52,292	300	316
Cambridge	62,048	340	395
Chicago	82,945	300	415
Cincinnati	38,959	200	207
Cleveland	49,897	170	198
Columbus	41,484	250	243
Dallas	51,629	150	234
Denver	22,763	150	169
Des Moines	44,830	400	338
Detroit	82,544	500	405
Houston	43,768	225	240
Indianapolis	53,003	300	235
Kansas City	68,435	275	479
Los Angeles	50,131	200	197
Louisville	33,674	200	168
Memphis	48,910	105	263
Milwaukee	37,638	200	283
Minneapolis	49,755	400	459
New Orleans	43,105	225	201
New York	80,675	800	447
Oklahoma City	48,059	160	254
Omaha	38,080	160	340
Philadelphia	69,665	325	293
Pittsburgh	44,044	250	256
St. Louis	52,451	300	283
San Francisco	34,630	200	296
Seattle	23,297	125	199
Portland	12,930	80	101

Sales Branches (United States):			
Charlotte	66,529	...	345
Fargo	15,759	...	277
Jacksonville	31,394	...	165
Salt Lake City	9,113	...	120
Washington	28,094	...	176

These figures indicate annual sales in the United States to Sept. 1 of 1,558,239, Ford cars and trucks.

Daily capacity of all plants in the United States on the basis of the above figures is 7,540.

Total dealers in the United States are 9241.

CANADA AND FOREIGN SALES

Assembly Branches	Annual Sales	Daily Output	Dealers
Buenos Aires	11,846	100	316
Barcelona	6,003	...	148
Copenhagen	13,505	100	192
Manchester	27,214	240	...
Montreal	6,566	70	99
Sao Paulo	3,481	45	248
Bordeaux	10,569	50	317
Toronto	12,277	150	111
Winnipeg	2,646	100	93
London, Ont.	4,362	35	60

Sales Branches:			
Calgary	2,468	...	101
Regina	3,317	...	124
St. John's	2,401	...	55
Vancouver	3,088	...	35
Windsor	2,611	...	20
Trieste	1,731	...	140
Montreal	863	...	124
Antwerp	6,192	...	123
Havana	704	...	41
Miscellaneous foreign sales	4,902	...	80

Total annual foreign sales on basis of above is 126,751.

59,957 Ford Cars Sold in Canada in 8 Months

DETROIT, Sept. 7—Sales of Ford Motor Co. of Canada, Ltd., during August totaled 6083, an increase of about 600 over the best previous August, but a falling off of about 1000 from July. Each month this year shows a gain over the best previous similar month, and the total for the eight months, 59,957, is 59 per cent more than the total for the first eight months of last year.

Sales for each month this year compared with the former record month as follows:

	1923	Previous High
January	5,750	3,834
February	6,567	4,459
March	8,417	5,544
April	8,294	6,155
May	10,021	8,123
June	7,725	6,367
July	7,145	6,495
August	6,038	5,441
	59,957	46,418

PARTS MAKER REACHES PEAK

SPRINGFIELD, MASS., Sept. 11—The Moore Drop Forge Co. is producing automotive parts at the highest rate of output in its history, said to approach \$1,000,000 monthly. Several additions to the plant have been made recently.

Ford Renews Effort to Buy Shoals Plant

Confers With Secretary of War— Gorges Power Unit Proves Stumbling Block

WASHINGTON, Sept. 11—Efforts have been renewed by the Ford Motor Co. to purchase the Muscle Shoals Power plant of the Government, at Sheffield, Ala.

Henry Ford, with his chief engineer, S. B. Mayo, and Edsel Ford, were closeted for nearly an hour with Secretary of War Weeks and President Coolidge last week.

The conference evolved mainly around an option which the Alabama Power Co. has on a 90,000 power unit at Gorges, Ala., 88 miles from Muscle Shoals, and which was included in Ford's original offer of \$5,000,000.

Equitable Agreement Sought

Ford refused to discuss the matter following the conference. Secretary Weeks, however, issued a statement declaring that the Government and Ford were seeking to come to some equitable agreement.

The secretary declared that Ford still desired very much to purchase the plant and that the Government, he felt certain, would eventually let him have it.

As the matter stands today, however, the Alabama Power Co. has first claim on the 90,000 power unit at Gorges, valued at considerably more than \$1,000,000. Should the Alabama Power Co. relinquish its claim, permitting the Government to buy the power unit, it will pave the way, Secretary Weeks said, for the Government to turn over the project.

The Government is willing to purchase the Gorges power unit, the secretary intimated, and will allow Ford credit for same. Ford has until Nov. 1 to make his decision as to whether or not he will purchase the Muscle Shoals plant without the Gorges power unit, and have its value deducted from the \$5,000,000 offer.

Power Plant in Wisconsin

MILWAUKEE, Sept. 10—The Ford Hydro-Electric Co. has been incorporated in Wisconsin with a nominal capital of \$25,000 to meet local requirements in getting a permit from the State Utilities Commission for the construction of a large hydro-electric generating plant on the Menominee River near Florence.

This plant is to serve the mammoth sawmill and body works at Iron Mountain, Mich., and other extensive timber, iron and copper mining interests being developed by Ford in Upper Michigan. Initial construction on the new power plant has started.

The power site is of a nature that makes it necessary to build the generating plant on the Wisconsin side of the river, the dam of course running from the Michigan to the Wisconsin banks.

Britain Issues Plan to Subsidize Trucks

Each Buyer of Approved Makes
Will Be Allowed £40 Yearly
by Government

LONDON, Sept. 2 (by mail)—Now that four makes of 1½-2-ton trucks have been accepted by the British War Department as complying with the official chassis specification, the details of the subsidy scheme in connection with their purchase have been issued.

Under this plan private buyers of trucks of the approved makes can obtain a subsidy of £40 a year from the British Government for each vehicle, providing they maintain the vehicles in reasonably good order. The War Department then is to have the right to buy the trucks at any time of national emergency at a price settled by a sliding scale.

This plan, it is expected, will encourage commercial firms to buy trucks of the kind the War Department considers it will need in wartime and simultaneously provide the War Department with a reserve upon which it can draw when required.

Wide Interest Aroused

Since the announcement that details of the plan would become available very soon thousands of applications for particulars, it is stated, have been received by the War Department, while the acceptance of four makes as complying with the original official specification (published in AUTOMOTIVE INDUSTRIES Aug. 17, 1922) has been followed by requests from fifteen other makers for copies of the final and complete specification.

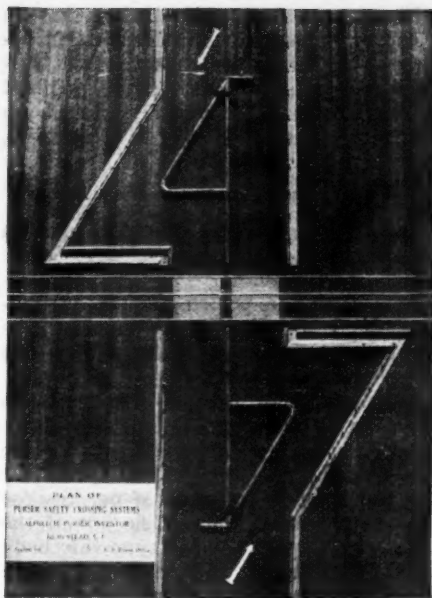
The plan refers to chassis of British manufacture with a useful load capacity of 30 cwt. (3360 lb.), and accepted vehicles must be equipped with tires of British manufacture and shod with such tires during the period of enrolment.

The period of enrolment will be one year, with the option on the part of the War Department, subject to the consent of the owner, to extend it year by year up to the maximum of three years. The inclusive annual subsidy of £40 will be paid to the owner in half-yearly instalments in advance, after inspection of the vehicle, the first instalment being paid on acceptance.

Periodical Inspection

The conditions of enrolment include special regulations regarding trials and inspections. Prior to acceptance an inspection will be made by the War Department representative, which will be followed by a trial run under full load for ten miles, the cost of this being incurred by the owner.

Every six months the subsidized vehicle will be inspected to see that it is being maintained in a thoroughly serviceable condition, and for such purposes also the inspector may make a road trial,



This safety device is made of concrete, 3 ft. high, and the entrances, indicated by arrows, are so constructed as to compel the motorist to slow down for the right-angled turn to the left, at which point his speed will be moderate enough for him to observe a red lantern if a train is approaching.

not exceeding ten miles, at the cost of the owner. In addition to this half-yearly inspection, the inspector shall have access to vehicles at all reasonable times in order to ascertain their condition and, if necessary, to request that repairs shall be carried out at the owner's expense.

If it is found on inspection that a truck has been allowed to fall into an unsatisfactory state, or that any of the conditions are not being complied with, the owner must put the vehicle into a thoroughly serviceable state of repair. If this condition is not fulfilled, the War Department will be at liberty to cancel enrolment, and the owner will be liable to refund the whole or any portion of the fees paid during the previous six months.

If, and whenever, during the continuance of the agreement the Army Reserve is called out on permanent service, the War Department shall be entitled to purchase any enrolled vehicle. The price to be paid will be based on the amount paid on the original purchase, plus 25 per cent, provided that the sum to be paid shall not be greater than the agreed total cost price nor less than 30 per cent of it.

The value of the truck will be arrived at by deducting from the agreed price 7½ per cent of that price for each half-year elapsing from the date of delivery to the owner, together with a further 1¼ per cent for each six weeks beyond the complete number of half years.

Should the military authorities deem a vehicle unserviceable when delivered after purchase, they can reject it.

In the case of accepted vehicles acquired by their users under the hire purchase system or any similar method of deferred payments, the actual purchase price will be depreciated 5 per cent per

(Continued on page 560)

Device Slows Cars at Rail Crossings

Makes It Necessary That Drivers
Go No Faster Than Five
Miles an Hour

NEW YORK, Sept. 11—In an effort to prevent automobile accidents at grade crossings an experimental device will be installed at the Merrick crossing of the Babylon turnpike on the Long Island Railroad which it is thought will be most effectual in stopping reckless drivers because it will be necessary to slow to five miles an hour before attempting to cross the tracks.

The device is the invention of Alfred H. Purser of Hempstead, L. I., who has interested the Long Island Railroad to the extent that the latter is willing to try it out. It can be installed at an expense of \$3,000 a crossing in comparison with the \$40,000 to \$85,000 the railroad has to spend for bridgework and approaches to a grade crossing.

Walls at Angles

The Purser device consists of a concrete wall three feet high which runs along the right of the approach to the tracks from a point about 100 feet from the nearest rail. About fifty feet from the tracks the wall turns further to the right at an angle of about 60 degrees and ends at a concrete abutment which runs parallel to the railroad tracks for about fifteen feet.

To the left of the driver, at the point where the wall on the right of the road takes the angle, there is another concrete wall of the same height which runs parallel to the angle about thirty-five feet and turns at right angles to the left. There it ends at another concrete wall in the center of the road, the end of which terminates within a few feet of the nearest rail.

This leaves a passageway wide enough for one car from the beginning of the angle to an opening on the railroad tracks, after making the second right angle turn between the left end of the abutment and the termination of the wall in the middle of the roadway.

The device is like an inverted figure four, with a straight passageway on the left of the middle wall for cars which have crossed the rails after winding through a similar device on the opposite side of the tracks.

Cars Form in Line

As each car enters the device it is compelled to fall in behind the preceding vehicle, and thus the driver who is willing to take a chance by going around other waiting cars is prevented from doing so by the concrete walls, which are high enough to prevent a car from bounding over them and low enough to permit the motorists to have a clear view of the tracks and also to let engineers see them.

FINANCIAL NOTES

Paige-Detroit Motor Car Co. has declared its regular quarterly dividend of 3 per cent on the common stock, payable Oct. 2 to stock of record Sept. 20, and the regular quarterly dividend of 1½ per cent on the preferred, payable Oct. 2 to stock of record Sept. 15. The previous quarterly dividend on the common was 3½ per cent and six months ago 2½ per cent was declared.

Reynolds Spring Co. reports net sales of \$264,504 in August and net income, after all charges, of \$45,318. For the eight months ended Aug. 30 net sales totaled \$1,770,686 and net income, \$224,298. After allowing for preferred dividends, the net income for the eight months was equal to \$1.28 a share on the 146,000 shares of no par common outstanding.

Reo Motor Car Co. has declared an extra cash dividend of 6 per cent in addition to the regular 1½ per cent, payable Oct. 1 to stock of record Sept. 15. A stock dividend of 10 per cent was declared three months ago in addition to an extra dividend of 6 per cent and regular quarterly disbursements of 1½ per cent.

McCord Radiator Manufacturing Co. reports net earnings for July, before taxes, of \$70,465 and for the five months ended July 31 of \$522,073. As of July 31 the company's current assets were \$1,785,989 and current liabilities \$288,411. There has been an increase of \$374,129 in working capital since March 31.

Jordan Motor Car Co. directors have declared a special dividend of \$5 a share on the common stock, the first paid on common since 1920. The regular quarterly dividend of 1½ per cent on the preferred also has been declared. Both dividends are payable Sept. 30 to stockholders of record Sept. 15.

Willlys-Overland Co. reports sales for the seven months to July 31 of \$87,862,593, against \$76,271,222 in the full year 1922, and net income available for interest and Federal taxes, after deducting charges, of \$10,154,441, against \$3,592,196 in the full year 1922.

Hayes Wheel Co. reports gross sales in excess of \$13,100,000 and net earnings of \$1,200,000 for the eight months ended Aug. 31. This compares with sales of \$12,967,000 and profits of \$1,346,000 for the full year 1922.

Detroit Motor Bus Co. has filed application with the Michigan utilities commission for permission to issue \$750,000 of securities, to finance additional lines and improvements to service stations and equipment.

Hendee Manufacturing Co. has declared the regular quarterly dividend of 1½ per cent on preferred, payable Oct. 1 to stock of record Sept. 20.

Chandler Motor Car Co. has declared its regular quarterly dividend of \$1.50, payable Oct. 1 to stock of record Sept. 20.

Goodyear Tire & Rubber Co. has declared the regular quarterly \$2 prior preferred dividend.

NEW CHEVROLET ZONE

LOUISVILLE, KY., Sept. 5—B. A. Rupprecht has been appointed sales manager of the new selling zone known as No. 22, recently established here by the Chevrolet Motor Co. for the purpose of better distribution of Chevrolet cars in southern Indiana, central Tennessee and central and western Kentucky.

There are about 225 dealers in the territory served by the office. It is believed that eventually the Chevrolet factory will establish an assembly plant here. The nearest assembly plants are now located at St. Louis and Cincinnati.

Britain Issues Plan to Subsidize Trucks

(Continued from page 559)

annum over the period of tire or payment, and the resultant figure will be deemed the total cost price paid by the owner.

An owner can request permission to have his vehicle withdrawn from enrolment, and this permission will not be unreasonably withheld. The department will consider the granting of permits for an owner to send the vehicle out of the United Kingdom. The type of body fitted by the owner is immaterial; it can be either for goods or passenger carrying.

Should an owner desire to sell an enrolled vehicle, he must apply to the War Office for permission, and in doing so he must give the name and address of the prospective buyer. Provided the latter is prepared to take over the agreement in respect of the vehicle under consideration, he shall be deemed to be substituted for the owner for all purposes under the agreement as from the date of the purchase.

No special permit is required for hiring out vehicles to third parties, the only stipulation being that, when the duration of hire exceeds one calendar month, the address of the third party must be forwarded by the owner to the War Office. The owner remains responsible to the authorities for all purposes.

Truck Makers Offer Help in Framing Legislation

ST. LOUIS, Sept. 11—At a meeting of truck manufacturers at the Melbourne Hotel a committee consisting of representatives of the Eagle Motor Truck Corp., the General Motors Truck Co. and the Autocar Co. was appointed to draft a letter to the Governor of Missouri and interested legislators offering assistance in framing legislation regulating trucks on Missouri highways.

It is expected that at the session of the Legislature next spring the question of loading of trucks will come up. Because of experiences in the past, when adverse legislation was passed because the lawmakers were without the help of competent engineers, it was thought necessary to take early measures to safeguard all interests.

Recently a law was passed in a municipality adjacent to St. Louis making it unlawful for a truck of more than two-ton capacity to drive over its streets. Efforts to show the officials of the community the error of such a stand were fruitless for some time, although the ordinance was finally amended to permit trucks of any capacity within their boundaries so long as they were not loaded beyond their capacities.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

The steadiness of the markets in the face of the Japanese disaster, the Greco-Italian controversy and the coal crisis is evidence of the fundamental soundness of domestic business conditions.

The latest report from the Department of Agriculture estimates this year's wheat crop at 789,000,000 bushels, a decrease of 4,000,000 bushels from the Aug. 1 estimate. The corn crop is placed at 3,076,000,000 bushels, 94,000,000 bushels above the previous figure, while oats show a slight drop. The price of wheat rose slightly during the week, while corn remained practically stationary and cotton again moved up sharply from 26.35 to 28.95 cents a pound.

Unfilled Steel Orders Decline

Unfilled orders on the books of the United States Steel Corporation on Aug. 31 amounted to 5,414,663 tons, as against 5,910,763 at the end of July. The August figure marks the sixth consecutive monthly decline, and is the lowest total shown since May, 1922. The production of iron in August was 3,435,313 tons, a decrease of 233,021 from July and the smallest monthly total since last February. The average daily output was 110,816 tons, as compared with 118,656 in July.

Car loadings set another new record in the week ended Aug. 25, with a total of 1,069,932, comparing with 1,035,741 the preceding week, 869,902 in the corresponding week last year, and 1,041,044, the previous high record, in the week ended July 28, 1923. The net operating incomes of Class I roads in July amounted to \$84,591,400, representing an annual return of 4.93 per cent. This compares with a return of 5.47 per cent in June and 6.50 per cent in April.

Fisher's index of commodity prices last week remained unchanged at 155 for the third consecutive week. Both Dun's and Bradstreet's reported a rise of 0.7 per cent from Aug. 1 to Sept. 1.

Discounts by Banks Drop

Discounts by the Federal Reserve banks declined \$34,600,000 during the week ended Sept. 5, \$22,900,000 of the decline being in bills secured by Government obligations and \$11,700,000 in "other bills discounted." Total deposits decreased \$5,200,000 and members' reserve deposits \$5,600,000. Federal Reserve notes in circulation rose \$32,500,000, while reserves decreased \$22,900,000, causing a decline in the reserve ratio from 77.5 to 76.4 per cent.

Loans of reporting member banks during the week ended Aug. 29 increased \$31,000,000, most of the gain being in loans secured by stocks and bonds. Net demand deposits declined \$9,000,000 and Government deposits \$11,000,000, while time deposits rose \$25,000,000.

Call loan rates declined from 5½ per cent early last week to 4½, rising again on Monday to 5 per cent. Time money was stationary at 5½ per cent.

Industry Will Feel No Steel Shortage

Demand From Japan Will Not
Affect Seriously Supply for
Automotive Products

PITTSBURGH, Sept. 12—Actual inquiries received in Pittsburgh and messages from the stricken area indicate a heavy demand for steel products for Japan in the emergency. Needs of the Eastern country for the present center in sheets, pipe and nails.

A survey of the steel situation, taking into consideration the tonnage required for the Far Eastern country, indicates there need be no alarm in the automotive industry of any shortage of steel supplies for the next two months. Available tonnages on certain lines of sheets, however, may be reduced, but this decrease will have no serious effects.

No Decrease in Sheet Supplies

It is practically certain there will be no decrease in the available supplies of full finished automobile sheets for the automobile industry, for aside from the steel corporation subsidiary, most of the independent manufacturers which make full finished sheets are not engaging in the galvanized sheet business, in which the Japanese demands will be largely centered.

A preliminary survey indicates there will be no appreciable demand for heavy steel products for Japan for some time as permanent structural work over there will progress slowly. Domestic conditions in the heavy steel market at the present time are easy, so that the automobile industry is practically assured of continuous supplies in that line.

However, the only possible shortage for the automobile trade lies in pickled black and pickled blue annealed sheets which are bought quite extensively for the automobile industry.

The saving factor lies in the fact that the leading producer of sheets in the country is tied up with domestic business for at least two months and must provide a large proportion of its output for the domestic trade after that time.

Independents Taking Orders

In consequence, the Japanese business in sheets is going to the independent steel manufacturers, who will produce and ship such material as emergency.

There is in Pittsburgh at the present time one inquiry for galvanized sheets that alone totals 10,000 tons.

A leading independent declared it was his belief that there will be a shortage of galvanized sheets for the domestic trade for three months. He declared every galvanizing plant will corrugate galvanized sheets for Japan. The heavier

proportion of black sheets being made into galvanized sheets will reduce the production of black sheets for the domestic trade and further, the available pickled black and pickled blue annealed sheets for the domestic trade will be measured by the pickling facilities of the mills for turning out the galvanized product.

In other words, the supply of pickled black and blue annealed that may be available for the automobile trade will depend on the facilities the mills have for turning out the large amount of galvanized required. In this alone, is there any reason to fear a shortage of sheets for the automobile trade.

The demand for sheets of all kinds for the automobile trade at the present time is particularly heavy, the total orders booked in these lines for the automobile trade in two days this week by the independent mills being 25,000 tons.

However, the demand for sheets, particularly black, in other lines of domestic industry, from the independent mills, is not very heavy. It has been so light, in fact, in some mills' books that they have cut the price on black below the corporation price of 3.85 cents to 3.75 cents.

INDUSTRIAL NOTES

Greenfield Tap & Die Co. announces that August sales and shipments were 14 per cent of August last year and compares with a 20 per cent increase in July and 26 per cent in June over a year ago.

Thurner Heat Treating Co., Milwaukee, established some time ago, has incorporated its business under the same title. The owners are Rudolph Thurner, William Schorer and E. Thurner.

Mulford Makes Record in "Climb to Clouds"

BRETTON WOODS, N. H., Sept. 10—Ralph Mulford, driving a Chandler car with its Pikes Peak engine, created a new record for the "Climb to the Clouds" here yesterday when he drove the eight miles to the top of Mount Washington in seventeen minutes. This gives him the record for the East as well as the West.

The record for Mount Washington was made by William H. Hilliard July 18, 1905, in connection with the first Glidden tour from New York to Bretton Woods. Hilliard in a Napier climbed the eight miles in 20 min., 58 2/5 sec.

AMERICAN MOTOR BODY CORP.

In the Aug. 23 issue of AUTOMOTIVE INDUSTRIES the American Motor Body Corp., recently organized in Philadelphia, was referred to as the American Body Corp., a misleading statement in view of the fact that there is a company of that name in Buffalo. The American Body Co. of Buffalo and the American Motor Body Corp. of Philadelphia are separate and distinct concerns, although both are body builders.

METAL MARKETS

While there has been no precipitate dash on the part of consumers into the steel market, fourth-quarter buying has been of sufficient proportions to engender confidence and cheerfulness. A good part of the sheet orders placed by automotive consumers was accompanied by specifications. Alloy steel specialists also have come in for gratifying orders for October shipment, and the improved demand for soft steel bars for drop forgings clearly indicates the placing of good-sized orders for the latter by automotive interests. Prices so far have undergone no notable changes. Their continuity will depend to a large degree upon the aggregate of the fourth-quarter volume of demand.

If indications point toward restricted routine buying on the part of consumers, there will be those among the producers who will consider seriously bringing about a change in prices as the best means of overcoming the aloofness of buyers. Whenever the steel market is at the crossroads of the problem how to speed up buying, there are always producers who believe in modest advances as the most efficient remedy, while others look upon reductions as the direct route toward more liberal commitments on the part of buyers.

The formers' philosophy is based on the theory that buyers are more likely to show interest in a market that has the outward appearance of an advancing one, and that they will prefer covering their requirements at the first sign of rising prices rather than wait until prices harden further. The latter have no faith in an artificially created situation of this sort, and rather trust to concessions to win buyers over. Regardless of whether they lean toward price reductions or advances as a means of quickening consuming interest, producers believe, however, in swimming with the tide.

The leading interest's policy appears to be good enough for the independents at this moment, and the largest producer's program seems to be one aimed at conserving prevailing base prices until developments reveal more clearly the psychologically correct moment for a change. The one notable change that has taken place in the steel market in the last few weeks has been one of sentiment, while the market was utterly deserted by buyers, the impression prevailed that the first change in prices would be in a downward direction. This has now given way to the belief that when prices do undergo a change, it will be upward.

Pig Iron.—While the market's undertone is a shade firmer, activity is rather light, and it is doubtful whether a come-back of one of those pyrotechnical displays of which the iron market is so fond can be staged during the remainder of the year.

Aluminum.—Arrivals from abroad continue rather heavy. The Steamship "Cabo Esparitel," in from Genoa the other day, had in her cargo 4200 bbls. of bars and 1071 ingots, the consignees being a banking house with Swiss connections. The sole domestic producer is reported to have opened fourth-quarter order books on the basis of 25 cents for 98 and 99 per cent virgin ingots. In the resale market sellers seem to be far more plentiful than buyers and 25 cents appears to have become a convenient level under which to cut fractionally.

Copper.—Following some buying by wire drawers, the market again turned quiet, but in the matter of price the worst seems to have passed.

Calendar

SHOWS

- Oct. 17-27—New York, Electrical and Industrial Exposition, showing electric trucks, cars, parts and accessories, Grand Central Palace.
- Nov. 4-10—New York, First Automobile Exposition of the Foreign Automotive Association, Hotel Astor.
- Nov. 11-17—New York, Annual Automobile Salon, Hotel Commodore.
- Jan. 26-Feb. 2—Chicago, Annual Automobile Salon, Hotel Drake.

FOREIGN SHOWS

- Sept. 28-Oct. 7—Berlin, Automobile Show.
- Oct. 4-14—Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.
- Oct. 15-20—London, Motorcycle Show, Olympia.
- Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

- Nov. 1-15—Buenos Aires, Annual Automobile Exposition, under the direction of the Automovil Club Argentino.
- Nov. 2-10—London, Automobile Show, Olympia.
- Nov. 22-Dec. 1—London, Motor Transport Exhibition.
- Dec. 8-19—Brussels, Passenger Cars, Trucks, Airplanes and Motor Boats, Aviation Palace.

RACES

- Oct. 28—Barcelona, Spain, Grand Prix for vehicles of 1500 c.c.; Nov. 1, International Grand Prix for cycle cars of 1100—Nov. 4, International Grand Prix for two liter.

CONVENTIONS

- Sept. 19-21—Boston, Fall Meeting of the Motor and Accessory Manufacturers Association.

- Oct. 8-12—Pittsburgh, Convention of American Society for Steel Treating.

- Oct. 8-15—Atlantic City, Convention of Electric Railway Association.

- Oct. 24-26—Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

- Nov. 12-17—Chicago, Annual Business Exhibit and Convention of the Automotive Equipment Association, Coliseum.

- Jan. 24-31—Chicago, Annual Convention and Show of the American Road Builders' Association, the former to be held in the Congress and the latter in the Coliseum.

- May, 1924—Detroit, International Motor Transport Congress under the auspices of the National

Automobile Chamber of Commerce.

S. A. E. MEETINGS

- Sept. 11—New England Section, Wheel Alignment, John F. Doby, Hotel Buckminster, Boston, 8 p.m.
- Sept. 17—Cleveland Section, The Single Eight and Its Merits, J. G. Vincent, Cleveland Hotel, Cleveland, 7:30 p.m., Dinner 6 p.m.
- Sept. 20—Metropolitan Section, Headlights, R. N. Falge, Automobile Club of America, 247 West Fifty-fourth Street, New York, 8 p.m., Dinner 6:30 p.m.
- Sept. 21—Mid-West Section, Inspection of the Nash plant at Kenosha, Wis.
- Oct. 25-26—Production Meeting of the S. A. E.—Cleveland.
- Jan. 22-25, 1924—Annual Meeting of the S. A. E.—Detroit.

July Deliveries Fell Below June in Detroit

DETROIT, Sept. 11—New cars delivered in Detroit in July showed a falling off of about 2000 from the June totals, according to the report of the Detroit Automobile Dealers Association. The totals for the two months were 5617, compared with 7505. Open car deliveries in July exceeded closed 3025 to 2592. Ford deliveries were 2484 evenly divided as to open and closed, a falling off of 400 from June.

All low priced lines showed a falling off, Chevrolet dropping from 1067 to 727. Overland had 195, Star 157 and Gray 49. Medium priced lines showed a severe falling off due to the many changes in models and inability to make deliveries.

Studebaker was high with 281, Willys-Knight second with 183; Hudson had 176; Essex, 168; Maxwell, 155; Jewett, 154; Oakland, 97; Rickenbacker, 92; Dodge Brothers, 72; Buick, 66; Hupmobile, 65; Nash, 56; Olds, 33, and Reo, 26.

Packard led the high priced lines with 42; Cadillac had 23; Paige, 20; Jordan, 20; Lincoln, 18; Marmon and Peerless, 7 each and Wills Ste. Claire, 6.

Truck deliveries fell off from 739 in June to 526 in July, the Ford total dropping from 467 to 350. Reo had 35; Dodge Brothers, 19; and Chevrolet, 16. In the light truck field, Federal led the heavy duty vehicles with 25; G. M. C. had 13; Mack, 9; White, 8; Gotfredson, 7, and Standard, 6.

Tractors delivered in July were 14, doubling the June total.

SALVADOR IMPORT DUTY

WASHINGTON, Sept. 11—An import duty of 1 cent gold per kilo on the gross weight of automobiles, accessories and other automotive equipment entering San Salvador by the sea is imposed under a tariff decree passed on July 19, the United States Bureau of Foreign

and Domestic Commerce has been advised by Minister Montgomery Schuyler, at San Salvador. The purpose of the tariff is to provide more funds with which to pay off the floating debt of the nation and is to apply against all merchandise entering the ports of Salvador.

Farm Prices Lead Iowa Bankers to Be Cautious

DAVENPORT, IOWA, Sept. 11—Banks throughout the seventh Federal Reserve district still display caution in regard to financing which indicates a feeling of uncertainty about farm prices. This is emphasized as the seasonal increase in loans to the agricultural section begins. There is a marked tendency to hold crops for higher prices, the monthly report says.

Loans in July were increased \$2,000,000, only half the June increase, for liquidation of the wheat crop in some sections has reduced many large obligations. Agricultural machinery sales showed an increase so far as threshing machines were concerned but the decrease in tillage tools sales offset this gain. Sales of 128 manufacturers for the first six months of the year were \$240,000,000, nearly 73 per cent of the total 1921 production.

Improvement Expected by Trade in Cleveland

CLEVELAND, Sept. 11—After experiencing an exceptionally good August, one that was characterized by trade volume far better than the average for the month, retailers here anticipate a slight betterment of trade.

The sentiment of some of the keenest dealers is, however, that trade will depend on industrial conditions. There has been a slackening of production in the different factory lines, and it is said this loss during August was slightly more than seasonal.

Farmers Buy Better Through Southeast

ATLANTA, Sept. 11—An increase of 10.9 per cent in tractor and power farming sales in the Southeast during July, 1923, as compared with July, 1922, is shown in the monthly report of the Federal Reserve Bank of Atlanta.

An increase of only 2 per cent is shown in July as compared with June, but this is nearly 25 per cent greater than May sales, while implement jobbers state that August sales will be still better when the figures for the month are all in.

There has been a steady improvement in tractor and implement sales among dealers throughout this district since July 1, due to the promise of an excellent cotton crop at the largest prices growers have ever received outside of war times. The outlook is excellent although sales have fallen off considerably in the extreme southern parts of Georgia and Alabama where excessive rainfalls the past two or three weeks cut the promised cotton crop 50 per cent below expectations.

Field representatives for the Atlanta implement jobbing houses advise that the outlook for fall, winter and next spring in the South for tractor and power farming sales is the best it has been in years, and nearly all dealers in the rural districts have increased their quotas for this period as a result.

70 SPEEDOMETER STATIONS

FLINT, MICH., Sept. 10—The United Motors Service, Inc., has completed the establishment of seventy nationally located speedometer service stations and more will be added to the string as rapidly as possible. In addition, similar service stations are being appointed as strategic points abroad, such service heretofore not being available in foreign countries.